RAILROAD GAZETTE

FRIDAY, SEPTEMBER 11, 1903.

CONTENTS

ILLUSTRATED:
The Ayer & Lord Tie Co.'s Preserving Plant, Carbondale 644
The First Locomotive in Germany 645
Some Early Irish Railroads 645
The Chaquette Pneumatic Dredge 646
The Illinois Central Improvements—Ballast 647
Locomotive Boiler Tubes 648
A New Hospital Car 649
New Locomotive Shops of the C., St. P., M. & O. at Sioux City 650
Box Cars for the Central of New Jersey 654
New Passenger Car Yard at South Boston 657
The Visintini System of Concrete Girders 657

CONTRIBUTIONS:
The Largest Eyebars 643
Phineas Davis's Grasshopper Locomotives 643
Estimate Versus Cost in New York Canal Work ... 643

EDITORIAL:
The Lessons of the Newark Crossing Collision 652
The Use of Freight Cars as Storehouses 652
Cleveland, Cincinnati, Chicago & St. Louis 653
Editorial Notes 652
New Publications 654
Trade Catalogues 653

MISCELLANEOUS:
Apprenticeship in Engineering Training 647
A German Study of the Labor Question 649
The American Locomotive Company 649
Trade Union Outrages in July 653
The Right of the Non-Union Man to Work 654
The American Street Ry. Association Convention .. 655

GENERAL NEWS:
Technical 657
The Scrap Heap 658
Meetings and Announcements 658
Personal 658
Elections and Appointments 659
Locomotive Building 659
Car Building 659
Bridge Building 659
Railroad Construction 659
General Railroad News 660

Contributions

The Largest Eyebars.

Narberth, Pa., Sept. 1, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your comments published with my letter regarding large eyebars, there are some statements made which need a reply in order to set the matter under discussion aright. In the first place, it seems very curious that the claim should have been made as to the manufacture of the "strongest" eyebar. Even if this is the strict construction which can be put on the article, it would be an absurd thing to claim. A 12-in. x 2½-in. or 10-in. x 3-in. bar could easily be made which would outrank the 14-in. x $1\,^{9}/_{10}$-in. or 15-in. x 2-in. bar in strength, but nobody would be interested in that. The interesting point is the width of the bar, as showing the advance made by the shops in continually increasing the limiting sizes of constructive members. In the second place, the reply states by implication (at least this would be inferred from it by anybody not closely familiar with the process of making eyebars) that the Phoenix bar is inferior to the Ambridge bar on account of being made by upsetting and hammering as against upsetting alone. Now, the fact is that the 15-in. bar had the heads fully formed by upsetting as much so as the 14-in. bar, but was subjected to an additional hammering in order to smooth the head and produce a good finish. The hammering has the effect also of strengthening the bar by putting more work into the mass of the metal, which can only be a welcome addition to the work put on it in rolling. The fact that the 15-in. bars have not yet been used in an actual structure means nothing as against the fact that enough of them have been made and tested to show that the same works could turn out any number needed for an actual bridge. There is also nothing to prevent there being a stronger material used in them.

HENRY SZLAPKA,
Consulting Engineer.

A Contemporary Engraving of One of Phineas Davis's Grasshopper Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is probably known to most of the readers of the *Railroad Gazette* that in 1831 the Baltimore & Ohio Railroad Company offered a premium of $4,000 "for the most approved engine, and $3,500 for the engine which shall be adjudged the next best." There were four competitors for these premiums, among them Davis & Gardner, of York, Pa., to whom was awarded the first premium. Their first locomotive was named the "York," and was built in the borough of that name, and shipped to Baltimore on wagons. They afterwards built two other locomotives in York, named respectively the "Atlantic" and the "Indian Chief." The latter was later rechristened the "Traveller." No authentic drawings or other representation of any of these engines has been known to be extant, until a short time ago, when the York County Historical Society discovered a "Seal of the Borough of York," of which an engraving is given herewith, enlarged about one and a half diameters. This seal was engraved by William Wagner, of York, at some time between the years 1831 and 1835. There is some other work of his extant which shows that he did some excellent work, so that probably the seal gives a correct representation of one of Davis & Gardner's locomotives.

From a description of these early engines, written by Benjamin H. Latrobe, and which was published in the *Railroad Gazette* of March 8, 1873, it may be inferred that it was the third one which was named first the "Indian Chief" and afterwards the "Traveller."

The name P. Davis on the boiler is engraved on the seal and indicates that the people of York were then

proud of the achievement of one of their citizens, as they well might be.

It should be added that you, your readers and the writer are indebted to Mr. Geo. R. Prowell, actuary of the York County Historical Society, for a copy of the seal, from which the engraving herewith was made, and also for the information of its origin.

M. N. FORNEY.

Estimate Versus Cost in New York Canal Work.

New York City, Sept. 7, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

One feature of the question not developed in your well-considered article, "The Barge Canal," in the last number of the *Railroad Gazette*, is the probable first cost. This is of interest to all engineers, but it seems not to have received any published attentions from those whose knowledge of our canal history best fits them to call attention to the serious excess of ultimate cost of canal construction in this State over the estimated cost. It is not intended to question the skill and care with which our State Engineer has made up his estimate that $101,000,000 is sufficient to complete a canal with 10 ft. of water on its miter sills, and with other dimensions as specified. Nor do I doubt that if Mr. Bond could live and be retained in office until the completion of the canal he would save as considerable a percentage on its estimated cost as the Engineers of the United States Government do on their estimated costs of improvements. But in the 20 or more years during which this canal will be under construction, Reformers of all stripes and colors must be placated and the changes of policy due to political exigencies will be many, to say nothing of obstruction from those who are so constituted that they honestly oppose all improvements for a public good.

The history of canal construction and canal improvements justify me in the prediction that the proposed Barge Canal will not be completed for less than $150,000,000. In support of this assertion a comparison of the engineer's estimated costs with the actual costs in nine instances is given:

	Engineer's estimate.	Actual cost.	Percentage of cost over Engineer's estimate.
Erie Canal, original	$4,926,738	$7,143,789	45
Erie Canal enlargement	23,402,863	36,495,535	56
Cayuga-Seneca Canal	811,188	1,306,542	61
Cayuga Inlet	150,000	214,000	43
Oswego Canal	227,000	565,437	149
Oswego enlargement	1,926,336	2,925,513	52
Crooked Lake Canal	119,198	333,287	180
Chenango Canal	1,960,450	2,782,124	42
Black River Canal & imprv.	1,068,437	3,224,779	202
	34,592,210	54,991,006	59

The Champlain and some other canals, in all of which the cost exceeded the official estimates, are not included, as considerable changes in plans were made requiring a misleading comparison. As many, if not all, of these estimates were made by able and careful men, well versed in their profession, it might be prudent to predict that the ultimate cost of the Barge Canal will be $160,000,000. Although some may doubt if the end of the job will remind us of the man who came here from Baltimore and found he had to stutter worse here than there, "because it is a bigger city," no one can expect such an entire reversal of our State history as to justify a prediction that the canal will be built within its estimate.

Another not generally recognized expense necessary to the successful and economical operation of the Barge Canal is insisted on with force in the report of Jan. 25, 1900, by the New York Commerce Commission, of which Charles A. Schieren was chairman. This report says: "No matter what improvements may be made to the Erie Canal, so long as shippers are compelled to have their cargoes transferred at Buffalo, the boats may be entirely at the mercy of the railroads," and asserts that "the duty of the State to create such terminal conditions as will make these high charges impossible is imperative." This means extensive transfer grounds. They are necessary with the Barge Canal, for vessels carrying 8,000 to 9,000 gross tons are now navigating the Lakes, and one of 10,000 tons is ordered. This means that in some cases as many as ten canal boats would have to lie about the last-mentioned vessel while she was unloading. I have no data by which to measure the cost of the necessary transfer docks and yards at and about Buffalo.

Justification for such expenditures by this State can only be found in an improvement so capacious and convenient as to insure the State the cheapest transportation route between the Lakes and this city; a channel on which the freight rates shall be low enough to develop the maximum production of commodities; a route on which the materials for manufacture can be assembled and the finished products distributed at less cost than in any other locality. The $358,000,000 worth of freight that passed the "Soo" last year, two-thirds of which is estimated as going somewhere to be advanced in value by further manipulation, should be converted to use nearer the largest city on this continent than the Lake front. Such results, and not high elevator charges on a small amount of grain at Buffalo and New York, should be looked for.

The large results do not seem acceptable to the advocates of the Barge Canal, who insist on the expense and delay of a wholly unnecessary transshipment at Buffalo, although the additional cost of time and money required to transfer freight has proved prohibitive to profits in railroad transportation. And although Governor Roosevelt's Committee on Canals show conclusively, on pp. 196, 197, that the railroads were steering the Lake traffic when there were 11½ ft. on the miter sills at the "Soo" (mistakenly put down as 10 ft. in the report), the advocates of the Barge Canal, undeterred by their mistake in the wasteful expenditure of $9,000,000 to obtain 8 ft. of water on the miter sills of the Erie Canal, now insist on an estimated expenditure of $101,000,000 for only 10 ft. on the miter sills, 1½ ft. less than the depth in the "Soo" locks, where as the above-mentioned report says: "There was not only a cessation of increase in Lake commerce, but a positive decline both in equipment and traffic." But after the opening of the lock with 18 ft. on its miter sills, "the annual increment rose to figures which soon made the Lake traffic one of the most important features of the internal commerce of the United States." Arguments based on the facts and figures presented in the two pages above cited seem superfluous. And any expectation of increased production or manufacturing in this State based on the profits of transshipment at Buffalo and the high cost of transportation by a canal of small cross section, like the narrow gage furore of 30 years ago, is doomed to disappointment.

The "Board of Engineers on Deep Waterways" report that a navigable channel for the boats now in use on the Lakes can be built from both Chicago and Duluth to New York for $208,000,000, and one with a 30 ft. channel between the same points for $333,500,000. If this improvement is carried out by the general Government there is no historical ground for asserting it will cost more than the estimate. At the Cleveland Convention of the International Deep Waterway Association the unanimous call was for "the deepest practicable channels between the several lakes and the seaboard to enable vessels of the most economical type to pass. . . . And the building of all permanent structures for a navigable depth of 26 ft. or more in order that the water courses may be progressively and economically deepened to the ultimate necessities of traffic." The entire West at that time seemed anxious for a navigable channel through this State. I was told by an officer of that convention that efforts to secure such a channel were given up on the assurance of New Yorkers that the State would not give its canal to the Government, i.e., would not give up its power to toll the passing traffic.

If the State builds the Barge Canal all of the necessary money will come out of the pockets of the people of this State, though 80 per cent. or more will probably remain in the State. If the Government builds the canal only about 10 per cent. of the cost will fall on the people of this State, with the same percentage of expenditure remaining in this locality. The small channel will be moribund before its completion and will not pay even those who hope to be its toll-gate keepers. The Barge Canal will add to the net resources of every producer and consumer in the country, and more than double the commerce of this city.

EDWARD P. NORTH.

[The *Railroad Gazette*, and, indeed, the whole engineering profession, has the highest respect for the thoroughness of Mr. North's studies, as reflected in the figures above presented. The comparison of actual costs with estimated costs on State contract work greatly illuminates our arguments to the same end, in the article referred to.

The conclusion that a ship canal, built by the National Government, would be desirable, does not now concern us. The Barge canal is before the Court. —EDITOR.]

The Ayer & Lord Tie Co.'s Carbondale Preserving Plant.

The timber preserving plant of the Ayer & Lord Tie Co. at Carbondale, Ill., is notable for several reasons, chief among which are its unusual size, the nature of its layout and structures, and the fact that it is designed to administer all of the successful processes of preserving. It was planned as an eight-retort plant with a capacity of 3,500,000 ties annually, although but six cylinders were put in at the start. The seventh cylinder has just been added.

The arrangement and character of the structures are in contrast with usual practice for similar plants in this country. In many cases the buildings are partly, or entirely, wood, and are bunched together, apparently without consideration to the fire risk incurred. In the Carbondale plant special attention was given to minimizing the fire risk by separating the buildings and using fireproof construction throughout. Being built for commercial purposes, it was essential that the plant should be able to administer the best treatment in the most economical manner; also, that liability of interruption through failures or breakdowns should be guarded against in every possible way.

Selection of a location for the plant was governed by three factors. First, the timber supply was to be drawn from Southern Illinois, from south of the Ohio River and along the tributaries of the latter. Second, a large part of the product of the plant was to be used by the Illinois Central Railroad. Third, the location must be at a point convenient for receipt and shipment of the timber. Carbondale was chosen as best answering these requirements.

The plant is on a tract of 190 acres lying along the St. Louis-Paducah line of the Illinois Central, over which the bulk of its supply of timber is received. It is also a short distance east of the main north-and-south line of the Illinois Central.

The accompanying plan of the plant and yards shows only a small part of these latter. There is approximately 22,000 ft. of standard-gage track, shown on the plan by the heavy lines. The light lines show the tracks for the tram cars. A ladder track connects the yard tracks with the Illinois Central. The expectation is to duplicate this track system on the opposite, or east, side of the plant.

The need for a considerable trackage system will be better understood when it is known that about 100 cars a day are handled in and out.

The structures include the cylinder and machinery houses, 115 ft. x 125 ft., under one roof; boiler house, 45 ft. x 90 ft.; storehouse, 45 ft. x 90 ft.; blacksmith and machine shop, 20 ft. x 40 ft.; three solution tanks, 28 ft. in diameter by 24 ft. high; a storage tank 20 ft. in diameter and 20 ft. high; an underground reservoir 28 ft. in diameter and 16 ft. deep; a water tower with 22 ft. x 30-ft. tank; also shipping platforms, sheds for electric hoists, etc.

The use of fireproof construction has already been referred to. The buildings are brick and steel on concrete foundations, and with Carey roofing on wood sheathing. The solution and storage tanks are made of $^{5}/_{16}$-in. tank steel, and rest on solid concrete foundations. The underground reservoir is concrete. The cylinder house has brick side walls, while the ends have corrugated galvanized-iron apron walls, extending down to the lower chords of the roof trusses. Canopy roofs project outward at an angle of 45 deg. from the bottoms of the apron walls a sufficient distance to afford protection to the cylinder doormen. The south wall of the cylinder house is the north wall of the machinery house, both being under the same roof. The equipment contained in the latter, which is 25 ft. wide, comprises two 9-in. x 14-in. x 12-in. vacuum pumps; seven pumps, 6 in. x 4 in. x 6 in., for producing pressure in the cylinders, there being one for each cylinder; a larger pump, 14 in. x 10½ in. x 18 in., for fire service and for pumping the solution from the underground reservoir back to the solution tanks; a 12-in. x 16¼-in. x 14-in., 500-ft. air compressor; two surface condensers, each having 600 sq. ft. of cooling surface and a hot well; a 600-h.p. feed-water heater; and two 75-k.w., 500-volt, direct-current generators belted to 115-h.p. engines, for lighting the plant and yards, and furnishing power for motors. These are duplicate units, one being sufficient to carry the load, the other acting as a reserve. The boiler house contains four 150-h.p. boilers carrying 100 lbs. pressure, two boiler-feed pumps, and a superheater having an hourly capacity of 6,000 lbs. of steam superheated 370 deg. F.

The retorts, or cylinders, are 6 ft. 2 in. inside diameter and 125 ft. 4 in. long, face to face of doors. Each one will hold 15 tram cars loaded with 8-ft. ties. They are made of $^{5}/_{8}$-in. steel plates, having single-riveted circumferential seams and double-riveted longitudinal seams. The retorts rest in timber saddles on concrete foundations. Interposed between each saddle and foundations are two sets of 2½-in. x 8-in. steel rollers, four per set, to provide for expansion. The cylinders may be worked from either end, and are covered with 1-in. moulded magnabestos to reduce losses by radiation.

The piping for any timber preserving plant is necessarily elaborate and complicated. Because of the size of this plant and the conditions provided, the piping is probably the most elaborate and complicated ever installed. There are 12 or more separate systems, there being three sets of steam piping, for timber steaming, for superheated steam, and for power respectively; the solution pipes, which are 10 in. in diameter from the tanks to the 12-in. headers, and 12 in. from the latter to the retorts; the compressed air pipes for forcing the preservative from the retorts back to the solution tanks; vacuum pipes from the vacuum pumps to the retorts; run-off pipes through which the solution may be run by gravity from the retorts to the underground reservoir, from which it is pumped back into the solution tanks; a blow-back system, by which the last remnant of preservative in the retorts is forced by compressed air back into the solution tanks after the valves in the solution pipes have been closed; a puddling system for agitating the solutions in the tanks by compressed air; also systems for water supply, fire service, and circulation of the condensing water. A view

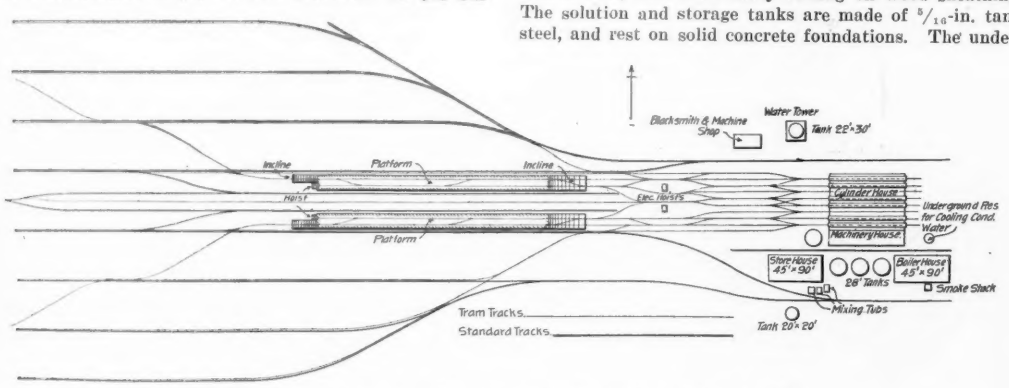


Fig. 1.—Plan of Ayer & Lord Tie Preserving Plant, Carbondale, Ill.

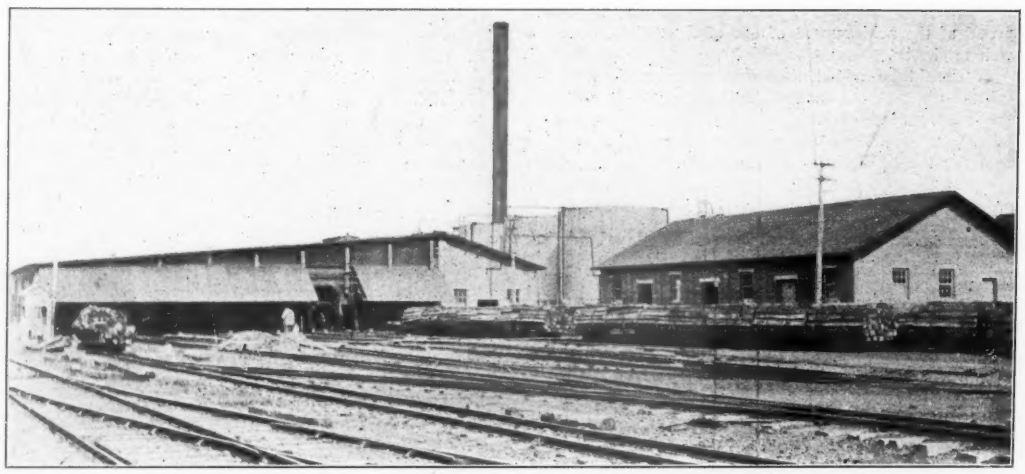


Fig. 2.—Cylinder and Machinery House, Store House and Solution Tanks.

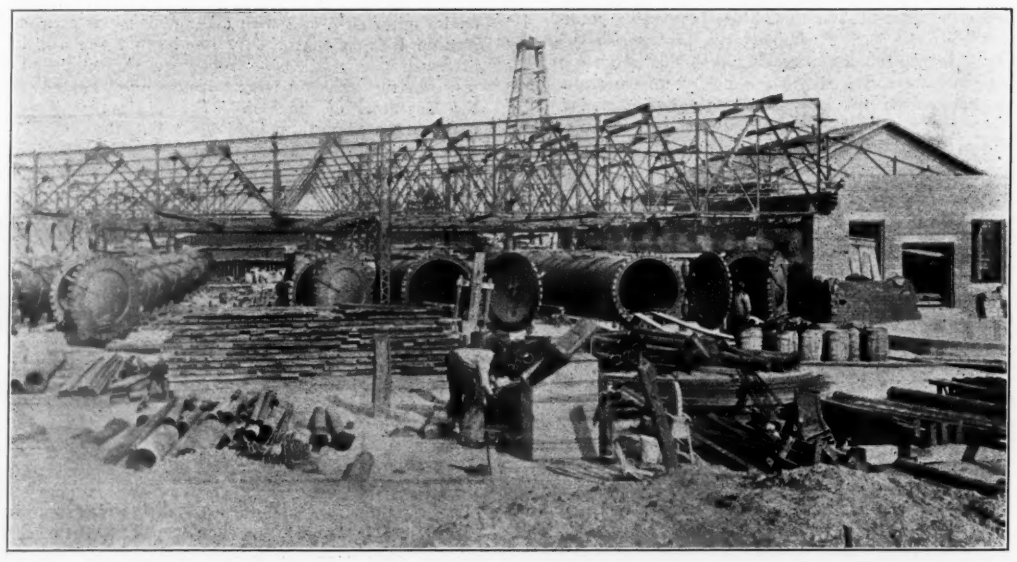


Fig. 3.—Erecting the Cylinder and Machinery House. Six Cylinders in Place.

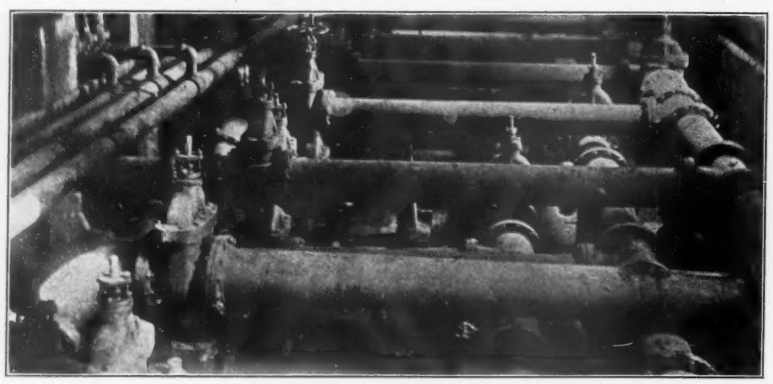


Fig. 4.—A Part of the Piping Under Machinery House Floor.

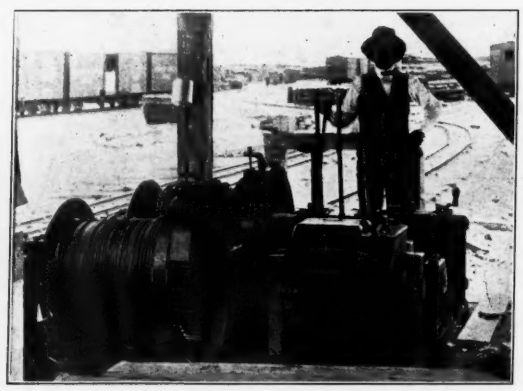


Fig. 5.—Electrically-Driven Hoist for Moving Tram Cars.

of the piping under the machinery-house floor, taken before the latter was put in, is shown in Fig. 4. The large pipes are for the solutions, three separate sets being seen, with the headers on the right. The lowest set is the run-off system. The other two sets form two independent systems between the solution tanks and the retorts. The headers for the solution pipes have valves midway of their length so that in case it is necessary to make repairs on some one part of a set, only half of it need be withdrawn from service.

The burnettizing process is being used exclusively at present. The zinc chloride is obtained in solution (60 per cent. strong) instead of the fused form. It is received in tank cars and forced into the storage tank by air pressure. From the latter it is fed by gravity to the mixing tubs, which are on a covered platform between the storage tank and storehouse. One of these tubs, the large one (8 ft. x 12 ft. x 4 ft. 6 in. deep), is on scales, enabling the preservative solution to be mixed readily by weight when desired. From the mixing tubs it is forced into the solution tanks by steam injectors.

The use of superheated steam in tie preserving plants is unusual. Works treating timber for marine purposes use it, circulating the steam in coils in the retorts during vacuum. The reasons for its use are as follows: By the usual method seasoned timber shows increased weight after the steaming and vacuum stages, being saturated with water, sap and other elements dissolved from the wood. But it is desirable that the weight be decreased. If, during vacuum, the retort temperature be maintained above the vaporizing point, the water and other liquids will leave the timber as vapor and pass over to the vacuum in that form, enabling a much higher degree of dryness to be obtained than by vacuum alone. As the amount of piping that can be put in a retort is limited, sufficient radiating surface cannot be obtained to give the desired temperature with saturated steam, and superheated steam is therefore used. But its desirability for tie preserving plants remains to be shown, as the advantage derived from its use may not justify the increased cost and trouble. There has been some delay with the superheater at Carbondale and no results from its use can as yet be given.

Burnettizing is a one-movement process, and the average time of treatment at this plant is eight hours, permitting three lots of ties per retort per day of 24 hours to be treated. For handling the ties there are 350 steel-frame tram cars, and 50 more are being added for the seventh retort. For moving these cars into and out of the retorts, and to and from the loading platforms, Lidgerwood hoists of 5,000 lbs. capacity, driven by electric motors, are used instead of the usual steam engines. Though more expensive in first cost, the economy, ease and readiness with which they may be operated makes them a desirable and satisfactory adjunct. At present there are four of these hoists in the yards, the locations being shown on the plan. Also an engraving from a photograph of one is shown in Fig. 5.

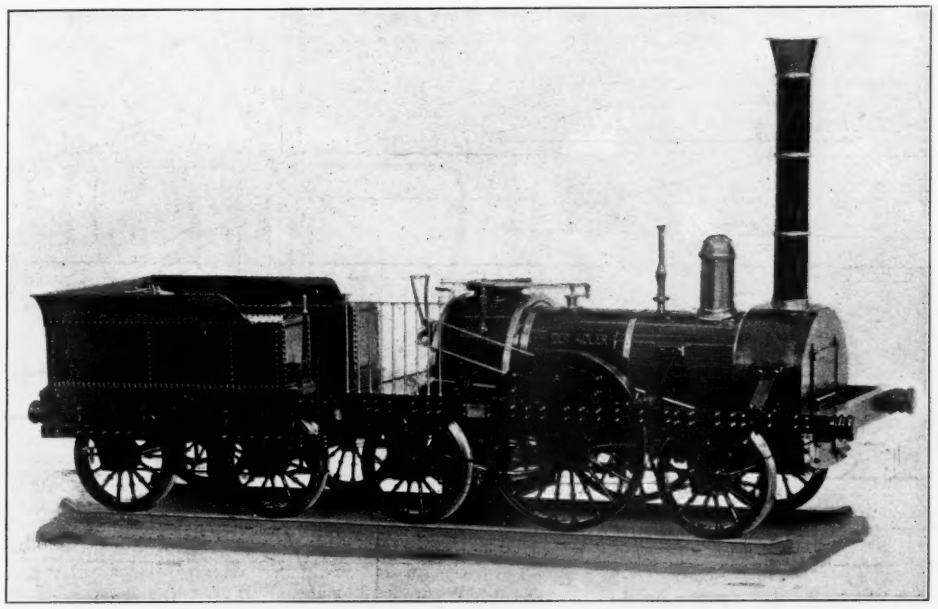
The blacksmith and machine shop contains equipment for making necessary repairs about the plant. It contains a lathe, drill press, two emery wheels, grind-stone, blower, forge, etc., all driven by a 7½-h.p. motor.

The plant was designed by, and built under the supervision of Mr. W. W. Curtis, Chicago, to whom we are indebted for information and data. It began operation in April and each month has shown an increased output. The output for May was 211,500, for June 225,000, and for July 284,700 ties. This was with six cylinders. The output of a plant depends on the process used, the kind of timber, and its condition. The largest week's output at Carbondale thus far is 68,620 ties from thoroughly seasoned pine.

The Ayer & Lord Company has a second plant nearing completion on the line of the Illinois Central in Mississippi. It is smaller than the Carbondale plant but is similar to it in other respects.

The First Locomotive in Germany.

The illustration shows a model of the first locomotive run in Germany. It was built in England by Stephenson & Ericson for the Nuremberg-Fuerther-Ludwig Railroad and was sent by boat to Cologne and from thence on wheels to Nuremberg. It was re-erected in the Spaeth Works, and went into service on Dec. 7, 1833. It cost about $6,000. The picture is from a model in the Nuremberg Transport Museum. The original engine had flangeless driving wheels 53 in. in diameter, and a working steam pressure of 50 lbs. per sq. in. There were only two eccentrics, which were shifted on the axle to reverse. The slide valves could be completely disconnected from the valve motion and moved by hand from the foot plate.



Der Adler—The First Locomotive in Germany.

Some Early Irish Railroads.

BY W. B. PALEY.

The early railroads of Ireland, though not very numerous, present some features of historical interest. The first line of any kind seems to have been a tramroad laid down in 1816 or 1817 from Dunleary to certain quarries on Dalkey hill, in County Dublin, preparatory to building the great harbor of refuge at Kingstown. This place, by the way, was called Dunleary until King George IV. visited it in 1821. The tramway was a single line with numerous passing places, and consisted of ⌋⌊ cast-iron plates, fixed by countersunk spikes at each end, driven through notches cast for the purpose into wooden trenails sunk in stone blocks. Though of the usual length, viz., 3 ft., these rails or plates were exceptionally heavy for the time, weighing 64 lbs. each. Doubtless this was to enable them to carry the heavy blocks of stone brought down for the harbor works. As the latter proceeded a single line was carried out upon each arm or breakwater. The tramway upon the outer or eastern arm still remains, as well as the main line itself, although disused. They are retained by the Government in case any replacement or enlargement of the harbor should be necessary. The two branches were each about a mile long, and the main line up to the quarries was about two and one-half more.

In 1828 the Arigna Iron & Coal Company laid three miles of tramroad to bring coal from the pits and iron ore to the iron works. "Fish-bellied" cast iron rails were used, the ends meeting in small chairs where they were secured by pins put through holes cast for the purpose. Though heavier, the rails were practically identical in design, except as to their ends, with the "fish-bellies" first cast at Butterley, Derbyshire, in 1788, by William Jessop for the Loughborough and Naupantan tramroad. The Arigna line was taken up about 1846, the company having come to grief some years previously, but one of the rails was lately shown at an exhibition of Irish minerals, held first at Cork and then at South Kensington. Arigna is in County Roscommon. The first locomotive line in Ireland was the Dublin & Kingstown, authorized in 1831 and opened for traffic on Dec. 17, 1834. It followed the line of the coast as soon as it got clear of Dublin, running upon a low embankment made in the bay a short distance from the shore. This embankment was faced with stone to protect it from the wash of the sea, the wall being carried up as a parapet 3½ ft. high above rail level. Openings at intervals permitted the tide to pass in, whilst three short promontories, on which were situated stations, were cut through by the line in its singular course. The embankment is about 50 ft. wide on the top, or double the width of the base, and 12 ft. in height, the water being quite shallow. The top width, however, at first, included a public walk on the outer side, separated from the railroad by an iron railing. As originally laid the English gage of 56½ in. was adopted, but this has long been altered to the Irish standard of 63 in., and the company is now known as the Dublin, Wicklow & Wexford. Additional lines occupy the room of the promenade just mentioned.

Stone being abundant in the neighborhood, it was used as a support for the rails, with the additional peculiarity that huge transverse stones, 6 ft. long, were inserted at short intervals. These made such fearfully hard running and caused so much injury to the rolling stock, besides the intolerable noise, that they were all taken out in a year or two. One line was relaid with cross ties, the other with longitudinal timbers, which, on part of the railroad, rested upon cross ties. This latter plan, which was also tried on the London & Croydon Railway about the same time, was found to have no advantages commensurate with the expense. As chairs were used also, the height of the structure presumably caused it to rock considerably.

The trains on the Dublin & Kingstown Railway in its early days presented an appearance which would somewhat startle the modern traveler, the first class coaches having purple table bodies with scarlet under frames, whilst some of the second class were painted green, and others a "pale patent yellow." Besides these there were Prussian-blue third class carriages, with open sides. All three classes seem to have been run by every train, a measure of liberality which no doubt largely contributed to the great financial success of the line. It paid 8 per cent. within a short time of its opening, the traffic being practically all in passengers. Huge central buffers and couplings combined, with coiled springs on a drawbar which was made in one piece, were used.

Most of the early engines were four-wheelers, with tenders, but several were soon turned into six-wheeled tanks. Three, the "Manchester," the "Hibernia," and the "Britannia," were built by Sharp, Roberts & Co., in 1834, and had outside vertical cylinders working a triangular bell crank, to the lower corner of which was attached the connecting rod to the driving wheel. These engines had tubular slide valves of peculiar construction, which did not answer well, since, when hot, they expanded so much as to cause great trouble. The cylinders were 11 in. x 16 in., the driving wheels being 5 ft. in diameter, while the usual working pressure was 50 lbs. The engines only weighed 10 or 12 tons in running order, as originally built. The consumption of gas coke of six engines, including the three bell crankers, was about 26½ lbs. a mile. Considering the numerous stoppages, and the waste of heat in such short boilers, this is very creditable to the engineering of 70 years ago.

Perhaps the most interesting point in the history of the Dublin & Kingstown is its connection with the once celebrated "atmospheric" system of traction. The company laid a single line of this alongside the quarry tramroad before mentioned, from Kingstown station to Dalkey village, 1¾ miles. It had a 15 in. cast iron tube between the rails, bolted down through projecting brackets to the ties, with a continuous slot along the top for the passage of the iron arm connecting the piston inside with the leading vehicle of the train. The slotted pipe continued to about 500 yds. short of the pumping engine at Dalkey, the end being run up by impetus. Exhaustion was carried on from that point by a closed 15 in. tube outside the rails, a branch valve being placed at the junction between the closed and open mains, by which the communication between the two could be cut off at will. The engine had a cylinder 34¼ in. x 66 in., steam being admitted at 40 lbs. pressure and cut off at one-quarter when the engine was at full load. The vacuum pump was double acting, of 66½ in. diameter by 66 in. stroke, and both the pump and the steam piston normally ran at 242 strokes per minute. Experiments were made on a short piece of the line on Aug. 19, 1843, when 20 in. of vacuum was got with 60 strokes of the pump, and three light coaches traveled up at 25 miles an hour. On November 9 the apparatus was completed to Dalkey and more experimenting proved that so much as 75 tons could be taken up in six minutes. In practice, however, this could not be maintained and 20 tons was about the maximum weight taken when the system got fairly to work. Leakage at the joints of the pipes and under the long ox-hide valve, which would not stand being ripped up and banged down again so fast without great wear and tear, always ruined the atmospheric. On this line, as on a similarly rising one at Ft. Germain, near Paris, later on, the piston was taken out of the tube at the top and brought back by the train, to save wear, the steep fall being amply sufficient to carry the train down. The line was not

An Early Irish Locomotive.

opened for public traffic until March 29, 1844, and remained in use until March 20, 1856. The average rise of the line was 1 in 140 until 365 yds. from the top was reached, when the gradient became 1 in 57. This served to check the train coming in and to start it out rapidly. Very severe curves existed, one being of only 547 ft. radius, but these and the gradients were improved when the line was converted to locomotive traction in 1856. It is now part of one of the two lines from Dublin to Bray.

The Chaquette Pneumatic Dredge.

The power-clamshell herewith illustrated is the invention of Mr. Ephraiem Chaquette. It consists of a cylinder (see Fig. 1) mounted upon guide rods, one end of the cylinder being hinged to the outer circumference of the clamshell on one side and the piston fixed to an arm which is hinged to the outer circumference of the opposite side of the clamshell, so that the admission of air to one side of the piston causes it to make an inward stroke, the cylinder thereupon rising upon its guiding rods and drawing the outer circumferences of the shell upward, thus opening the cutting edges of the clam.

The application of compressed-air at any pressure required by the character of the work, to the reverse side of the piston, causes it to move outward, the cylinder settling down, meanwhile forcing the two jaws or cutting edges downward and together. The closing is automatic, being controlled by a slide, a coiled spring and a four-way valve. The single hoisting cable is attached to a slide within the cross beam of the clam. The spring in the slide is compressed while the weight of the clam is sustained by the cable. When the clam rests upon the material and the cable and slide are relieved of its weight the expansion of the spring operates a valve which closes the clam. At the desired elevation of the clam a tappet engages the valve and shifts the air pressure to the reverse side of the piston, causing the clam to open and discharge, after which it is returned for a new load. The single pipe conveying air to the valve at the cross beam of the clam winds around a grooved sheave.

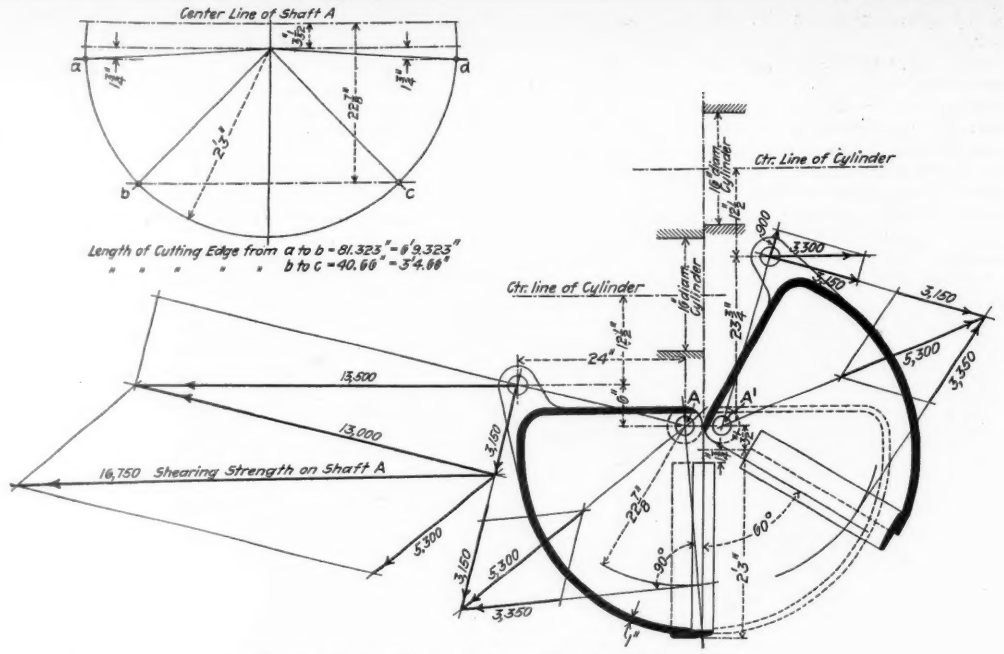


Fig. 2.—Force Diagram—Chaquette Pneumatic Clam.

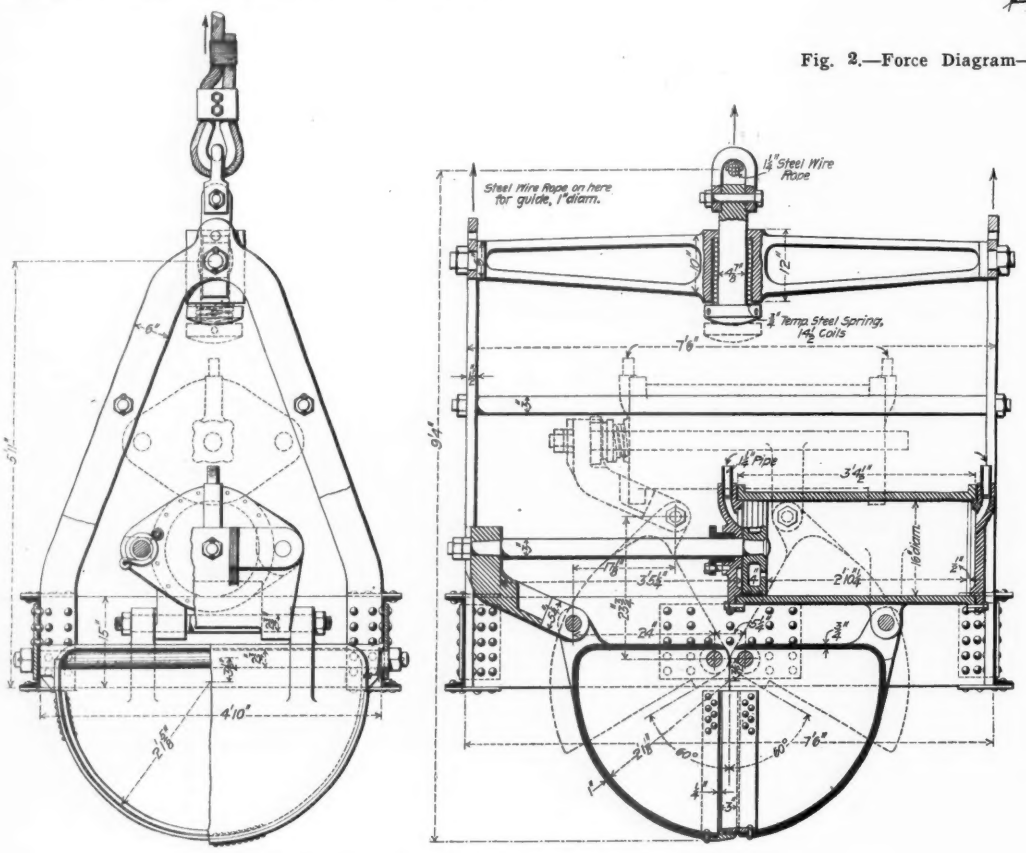


Fig. 1.—The Chaquette Pneumatic Clam for Dredgers.

With a cylinder 16 in. diameter and an air pressure on the piston of 67 lbs. per sq. in., the cutting force exerted by the one yard clamshell under construction, as shown by the force diagram Fig. 2, is as follows: On half the clam there is a force exerted from the cylinder of 13,000 lbs. when the clam starts to cut. When the clam is closing there is a force of 3,350 lbs. on the cutting edge, or 41 lbs. per linear inch, the total cutting edge being 81.3 linear in., the bucket being calculated for 1 cu. yd. capacity. There is a force without counterbalancing of 37 lbs. per linear inch at the beginning of the stroke, due to the weight of the clam. The force diagram only takes into account the forces from the compressed air cylinder. Friction losses are taken account of by calculating the forces from the friction circle 22⅞ in. in diameter.

For subaqueous excavation two clamshells of this design are operated from trucks traveling automatically on an elevated structure at one end of the hull. These clamshells travel back and forth, each at the same distance from the center, thus keeping the hull on an even keel, and avoiding strain due to rocking and wrenching. If one clamshell gets out of order work may be continued at half capacity. In its ascent the frame of the clamshell engages an arm, and by a simple mechanism carries up beneath itself a chute which becomes locked at an incline of about 45 deg. at the moment of highest elevation, and the clam discharges its load into the chute from which it is conveyed by traveling aprons or inclined chutes into two scows, one at either side of the hull. These inclined aprons drop by gravity and may be adjusted to discharge forward, aft, or to either side.

To steady and prevent tipping each clam carries two counterbalancing cables which are attached to the outer extremities of the clam frame and lead upward over sheaves and then aft over sheaves, to counterbalancing weights, which are adjusted to the character of the material to be handled. In soft material only a small percentage of the weight of the clam will be lifted, the power exerted being only that necessary to raise the material. When hard material is found the counterbalancing weights will be removed and the 37 lbs. per linear inch due to its weight is added to the penetrating power of the clam. In soft material a comparatively light air pressure will be used, sufficient only to close the clam, which may be increased to the maximum by the movement of a valve, when the material is found to be very hard. The machine thus has great flexibility.

A cover is provided for the clamshell, so that from depths beyond 30 ft. it may be hoisted at a high rate of speed, the jaws being tightly held together by air pressure, without danger of washing away the load.

For work in the roll of a seaway this clam will be lowered to the bottom, and the hoisting cable relaxed. It will be steadied by its counterbalancing cables which perform the work of the poles now used. For use in gold fields it will be lowered near to the surface to be scraped, and by an automatic arrangement will slowly close and pick up the surface material without undue disturbance of the particles. In the marl fields of Michigan where its use is being considered it will descend to any depth and bring up a maximum load each trip, thus enabling the continuance of work on a paying strata of marl to a depth impracticable by present methods. The bite of the clam being sufficient under low pressure to crush the lumps, and the air pressure in the cylinder adequate to hold the jaws tightly together and prevent the sifting out of the small particles, it is highly efficient for handling bituminous coal.

An application of this clamshell to land excavation is shown by the illustration, Fig. 3. The land dredge has a curved boom high enough to carry underneath a chute into which the excavated material is dropped. There is no necessity for swinging the boom, which operation takes about 30 per cent. of the time with the usual type of dredge.

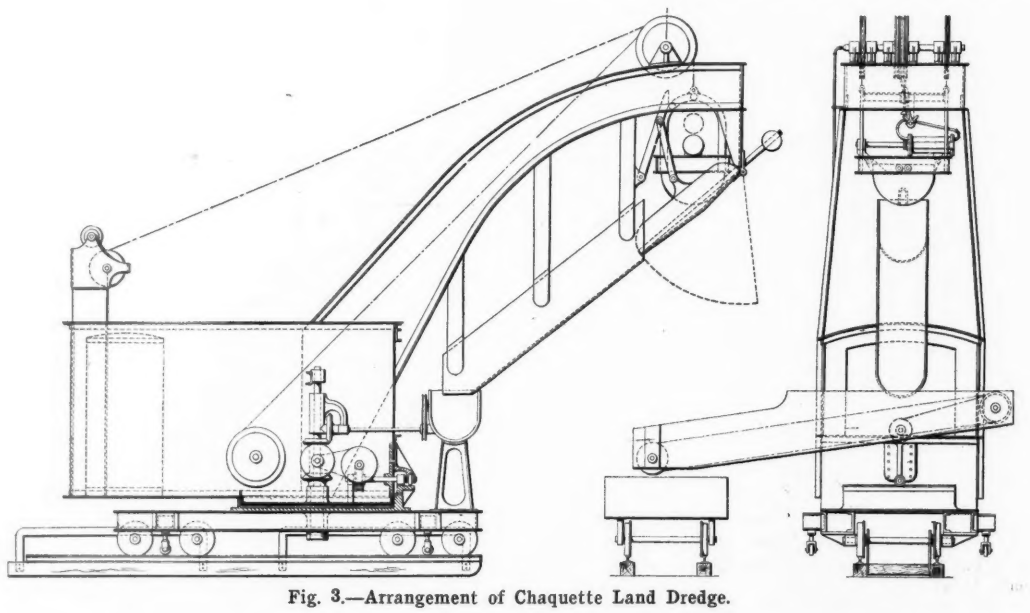


Fig. 3.—Arrangement of Chaquette Land Dredge.

The Chaquette Dredging & Contracting Company, New York, controls the patents. The details for this description have been obtained through the courtesy of Mr. C. E. Davenport, New York City.

The Illinois Central Improvements—Ballast.

The grade reduction work now in progress on the Illinois Central was described in the *Railroad Gazette*, Aug. 14, and an account of second track and new lines building was given in the issue of Aug. 28. The present article is a continuation of the series and describes the ballast on the lines as it now exists, and the ballast work which is being done. A photograph of the quarry at Princeton, Ky., which is the largest of the plants that supply ballast to the railroad, was shown in the paper Aug. 31. As in the previous articles, we are indebted to the officers of the road, and particularly to Mr. W. J. Harahan, Assistant General Manager, and Mr. H. U. Wallace, Chief Engineer, for the information.

On the main lines of the Illinois Central and the Yazoo & Mississippi Valley, crushed stone, loose gravel and cementing gravel are the three types of ballast used. On branch lines, loose gravel, cinders, stone screenings, furnace slag and chatts are used, depending upon the importance of the line and the conditions which will afford the most economical material for the required purpose.

The main line divisions from Chicago, Ill., to Fulton, Ky., 406 miles; from Louisville to Central City, Ky., 126 miles, and from East St. Louis, Ill., to Carbondale, Ill., 92 miles, are ballasted with crushed stone, making a total of 624 miles. Ballasting with crushed stone is also in progress from Fulton to Memphis, and from Canton to New Orleans, the ultimate intention being to have stone ballast for the entire distance between Chicago and New Orleans.

The lines ballasted with gravel are as follows:

Loose gravel—	Miles.
Chicago, Ill., to Omaha, Neb.	506
Cherokee, Iowa, to Sioux City, Iowa	60
Cherokee, Iowa, to Omawa, Iowa	61
Waterloo, Iowa, to Albert Lea, Minn.	101
Freeport, Ill., to Centralia, Ill.	273
Gilman, Ill., to East St. Louis, Ill.	212
Evansville, Ind., to Peoria, Ill.	240
A total of	1,453
Cementing gravel—	
Central City to Memphis, Tenn.	270
Memphis, Tenn., to New Orleans, La.	394
Fulton, Ky., to Grenada, Miss.	212
A total of	876

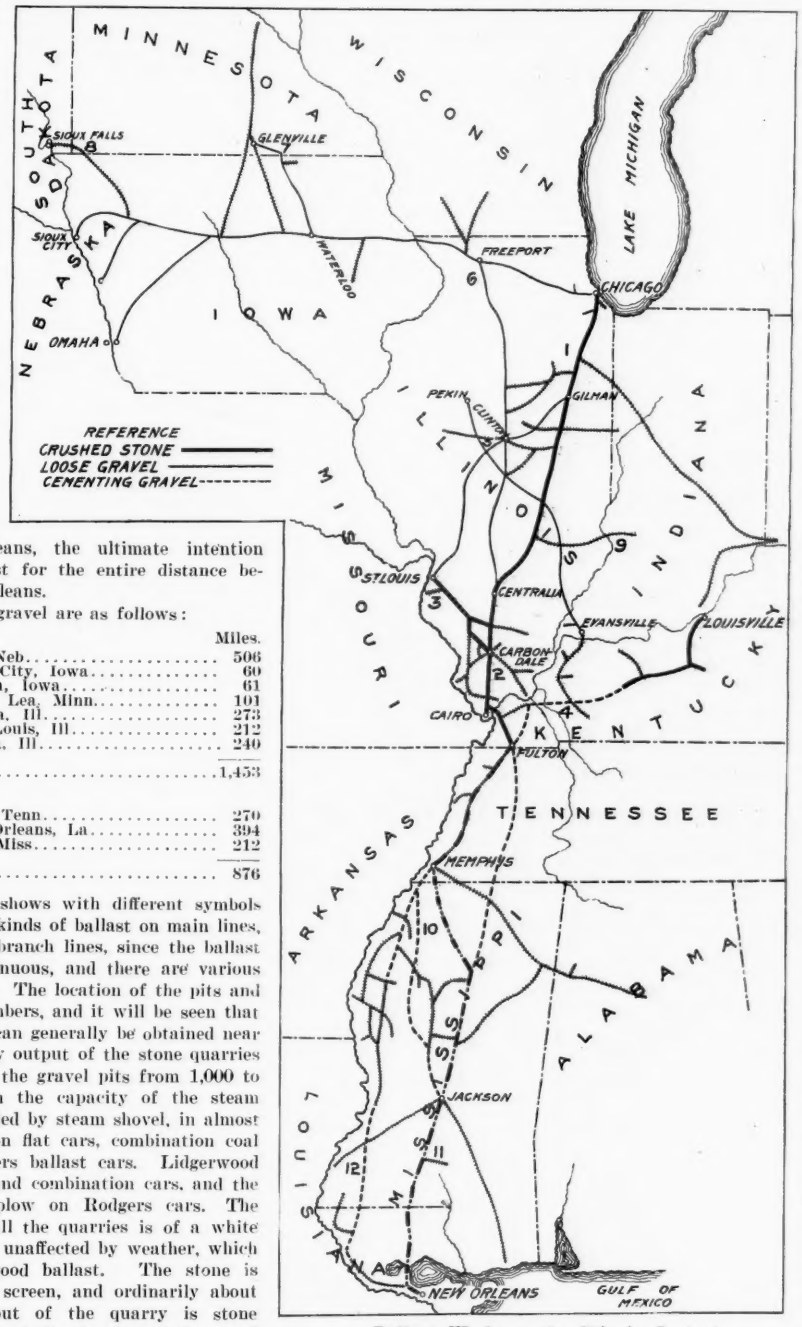
The accompanying map shows with different symbols the location of the various kinds of ballast on main lines, but makes no reference to branch lines, since the ballast in many cases is not continuous, and there are various kinds on different districts. The location of the pits and quarries is indicated by numbers, and it will be seen that ballast of the desired kind can generally be obtained near at hand. The average daily output of the stone quarries is about 1,000 yds., and of the gravel pits from 1,000 to 2,000 yds., depending upon the capacity of the steam shovels. The gravel is loaded by steam shovel, in almost every case, and is hauled on flat cars, combination coal and dump cars, and Rodgers ballast cars. Lidgerwood unloaders are used on flat and combination cars, and the ordinary Rodgers ballast plow on Rodgers cars. The crushed stone obtained at all the quarries is of a white limestone variety, hard and unaffected by weather, which makes it an exceedingly good ballast. The stone is screened through a 2½-in. screen, and ordinarily about 15 per cent. of the output of the quarry is stone screenings, which are used for ballasting branch lines and unimportant main lines. The stone screening, which is perfectly free from dirt, makes a fairly good ballast for comparatively light traffic. These quarries, in addition to furnishing ballast, supply the necessary material for concrete work, which is now being done extensively. The stone is practically the same in all of the four quarries, although the quarries are located in widely different localities.

The loose gravel, which is found entirely north of the Ohio River, is a deposit of good clean material, which does not churn, and drains very readily, so that it is a very desirable ballast.

The cementing gravel ballast, which is found entirely south of the Ohio River, is of two kinds. The kind found on the division between Louisville, Ky., and Paducah, Ky., is a light colored material strongly intermingled with clay, which washes out under exposure to rain and weather, but has certain cementing qualities which makes the ballast inclined to cake and very solid. It affords a good bearing for the ties and drains readily, but is somewhat inclined to churn, as it gets pretty well caked together entirely through the mass. The other kind of cementing gravel, which is found south of Memphis, Tenn., is a cleaner gravel than that mentioned above, but is colored by a deposit of iron, and is inclined to cement itself together. As with the other kind, it has a tendency to make the track churn. On the main lines, where traffic is heavy, this ballast is being replaced with crushed stone, as previously stated.

There are several smaller pits of material very similar to sand, which is usad to ballast the lines adjacent to the pits. The Rosetta pit, east of Natchez, Miss., indicated by the number 12 on the map, and the Sarah pit, near Sardis, Miss., indicated by the number 10, are examples of this. They are both on the Yazoo & Mississippi Valley lines.

For the first ballast on new work, such as second track, grade reduction and extension of lines, we are using the furnace slag, which is exceedingly good for that purpose, affording excellent drainage and unaffected by the climatic conditions. This material is received from Chicago, and for the past two years the entire supply has been going south of that point, as the construction work has been largely between Chicago and New Orleans. The economy in the cost of transporting of this material is an important feature. The coal traffic between Chicago and the Ohio River is largely north-bound; consequently the cost of hauling this slag south is very materially lessened by the fact that coal cars would otherwise have to be handled back to the mines empty.



Ballast Work on the Illinois Central.

1—Kankakee Rock Quarry.
2—Ullin Rock Quarry.
3—East Carondelet Rock Quarry.
4—Princeton Rock Quarry.
5—Kenney Loose Gravel Pit.
6—Forreston Loose Gravel Pit.
7—Glenville Loose Gravel Pit.
8—Cherokee Loose Gravel Pit.
9—Merom Loose Gravel Pit.
10—Sarah Cementing Gravel Pit.
11—Brookhaven Cementing Gravel Pit.
12—Rosetta Cementing Gravel Pit.

The estimated output of the quarries and pits this season is as follows:

Crushed stone—	Yards.
Kankakee	195,000
Ullin	180,000
Carondelet	93,000
Princeton	253,000
Loose gravel—	
Kenney	166,000
Riverton	136,000
Coleman	130,000
Forreston	90,000
Glenville	90,000
Cherokee	183,000
Grand Rivers	112,000
Cementing gravel—	
Brookhaven	392,000
Sarah	223,000
Rosetta	150,000
Furnace slag	330,000

The standard ballast is 12 in. deep under the tie and 12 in. shoulder beyond the end of the tie, for main line; and 10 in. ballast under the tie on branch lines, with the same amount of shoulder. This is for crushed stone. For gravel, 12 in. of ballast is used under the tie in main line work, with an 18 in. shoulder beyond the end. On branch lines, gravel ballast is 10 in. deep under the tie, and a 12 in. shoulder is laid. This averages about 3,200 yds. per mile for main line, and 3,000 yds. per mile for branch lines.

Apprenticeship in Engineering Training.*

BY PROFESSOR JOHN DEWAR CORMACK.

Until the beginning of last century, entrance into the trades and the professions could only be obtained by means of an apprenticeship extending over seven years, during which the apprentice was bound to serve a master, who on his part undertook to keep the apprentice and to teach him his work. The system, as it then was, led to many abuses, and the Act of 1814 was designed to counteract these. It opened wide the doors to all except a few professions, and no restriction was placed either on the manner in which a youth learned his future occupation, or the duration of his training. At that time engineering, except in a few branches, was just emerging from its position among the crafts. The removal of the restrictions to entrance may have been harmful in some ways, but at all events it allowed free entrance to many men who, although trained for other pursuits, became pioneers in different branches of engineering.

Although the restrictions were removed, there still remained the idea that the proper way to become an engineer was to spend a period of five years or seven years in the workshop or office. Probably, then, in the existing state of what we are now proud to call the profession, this was desirable, but now, after a century which has seen vast developments in engineering practice, and during which, with ever-increasing rapidity, scientific discovery is turned immediately to practical utility, it seems reasonable that some more generally recognized system of apprenticeship should be devised or recommended to suit the new conditions.

The inadequacy of the old system of apprenticeship has been realized for some time; so long ago as 1866, Sir John Fowler laid stress on the importance of combining the study of science and engineering theory with the ordinary apprenticeship. Since then it has become more generally recognized that the proper training for an engineer involves training both in theory and practice, and this has for the past seven years been emphasized by the institution in demanding a knowledge of theory from candidates for associate membership.

When the technical education fever was at its height, opinion, to some extent, went to the other extreme, and it was thought by many that at last we had arrived at the solution of the problem. The numerous universities and technical colleges were expected to be able to turn out young engineers equipped not only with the necessary technical knowledge but with experience gained in the college workshops.

In the United States and on the Continent this system of training has been, to a large extent, adopted, but there are indications of an increasing tendency to diminish the workshop practice in the colleges, and to substitute a training in workshops under commercial conditions.

Especially in the case of the United States does one see excuse for such a system, for the extraordinary rapidity of the increase of engineering business there has created a corresponding demand for young men, possessed of scientific knowledge and some technical training, and capable of filling responsible positions.

In this country (England), however, starting with a pre-eminent position in engineering, we have advanced with the times, perhaps at a less rapid rate than elsewhere, but still with sufficient prosperity. Interest in the training of young engineers has not been so generally aroused. Biased as some were by the old traditions, infected as were others by the technical education fever, the advice given to our young engineers has been very varied, with the result that at present training is in some quarters found to be in a rather chaotic condition.

The Institution has for many years devoted most careful attention to the conditions of training which should be fulfilled by those coming under its purview. The "regular training" prescribed by its by-laws is defined by the Council's rules to involve a minimum period of three years' pupilage or training as an assistant, where the standard of education is simply that required for admission as a student; and such minimum period of practical training may be reduced to two years where a recognized college course of study is taken. In each case the practical training must comprise both experience in the office and in or upon the works.

The Institution clearly contemplates a scientific and a practical training for all, and, taking this as a matter of common agreement, the questions to be discussed are:

(1) How should the knowledge and experience in each be acquired?

(2) Is there any arrangement suitable for all branches of engineering, and if not what modifications are required for the different branches?

*Extracts from a paper read before the third section of the Engineering Conference of the Institution of Civil Engineers (London), June, 1903.

(3) Over what period of time should the complete training extend; and what is the best arrangement and division of the time?

Let us look for a moment at the raw material and the finished product, leaving out of account the genius who may achieve eminence in engineering without special training. The raw material is a youth of 17 or 18, fresh from school, educated perhaps to a standard below that which might be desired or expected, and supposed to be endowed with common sense, natural aptitude for the profession and sufficient physical strength: and the finished product is a blend of scientific and technical knowledge, practical experience and business method. Our colleges should supply the first two requirements, but I venture to submit that the last two can only properly be acquired in the workshops and offices, and that no training can be considered efficient that does not include a considerable period of practical apprenticeship. Colleges may supply knowledge relating to the properties of materials, the theory and structure of machines, instruction in testing and in the methods of attacking new problems; but it is only under actual commercial conditions that there can be acquired the proper type of practical experience, adequate knowledge of the design and construction of machines, experience of and sympathy with the workman. It is in the factory or office that there can be gained, by observation and imitation, some knowledge of routine, estimating, organization and management, business methods and administration, the production of the maximum amount of work with the minimum friction and at the minimum cost. Imitation of good example counts for much in engineering as in other professions, and to this no doubt can be largely traced the continuance of the success of our national engineering, despite our comparative slowness in advancing with the times. It is in this respect that Continental and American systems of training will be found deficient. There the young engineer is launched into his future occupation after a college training of four or five years with workshop experience gained, especially in America, only in the college, and with sometimes a total commercial experience of a year or less.

Underlying all branches of engineering there is to some extent the same practical foundation. All demand knowledge of the properties and uses of materials of construction, and of the methods and processes by which they are converted into structures and machines. In many of the branches it is generally realized that a man must go "through the shop," and after all, the processes in one "shop" do not greatly differ from those in another. Workshop experience is not, however, generally included in the training of all engineers, but surely it is desirable for all, and especially and increasingly so when steel has displaced to a large extent masonry and timber, when all types of motors bulk largely in their work, and when machines of all kinds are utilized to construct to their designs.

If it is considered desirable that the training of all engineers should include experience in suitable workshops and factories, specialization being confined more or less to the drawing office, the question under discussion is limited to the consideration of the time required, and the best division of that time between the college and the workshop. The duration of training depends to some extent upon the arrangement of the course; but, probably, it may be safely said that to produce the ideal young engineer the training should extend over five or six years, which might be about equally divided between the college and the workshop.

Is there any one system that is the most desirable? I leave it to discussion chiefly by engineers in practice, as I feel certain that the colleges are anxious to have a solution of this problem, and to adapt their courses to any scheme or schemes that may be thought desirable.

In this country at the present time the systems in operation might be classed as follows:

(1) *Workshop only.*—This is a survival of the old traditions. It demands physical exertion during the day and mental strain at night if theory is to be acquired. Many eminent men in the past have undergone the strain and emerged successfully; but in the future the ever-increasing demand upon the engineer will render it unpractical, and almost impossible.

Many clever youths enter the shops on this system with limited opportunities but with great ability, and provision should be made for them in any scheme of training.

(2) *College only.*—This has already been alluded to. Under exceptional circumstances, such as obtain in the United States, it may be expedient, but it is undesirable.

(3) *Works Before College.*—A youth entering college after, say, three years in the factory and office is in many respects a good type of student. He has gone through the shops at the receptive and imitative age; he has ascertained whether engineering is still to his liking, and comes to college with a knowledge of processes, materials and machinery. He has some idea of what he wants to know and what branch he wishes to enter; but has often wrong theories which are difficult to uproot. Teachers prefer this type, provided he has continued his studies during his apprenticeship; but this is not always or even generally the case. The youth may have forgotten much of his school training, and, what is worse, he may have forgotten how to study. If he has studied it is under trying conditions, when he is physically tired, and he may wish to confine his studies to the more interesting technical subjects, the science underlying them being more or less neglected, and in consequence his progress is less rapid. He comes to college probably disinclined to begin again and gain the scientific knowledge which ought to precede all its applications.

(4) *College Before Works.*—A youth fresh from school and sufficiently educated is likely to make good progress in his scientific studies. In the technical work he is handicapped by his want of knowledge of manufacturing processes and the operation of machines, and is unable to associate his theoretical studies with practical examples of which he has had experience. Laboratories help to some extent to reduce the handicap. If this was to be the standard training there would be a greater plea for college workshops, which would supply some little practical experience, but which could not supplant, even partially, the workshop training under commercial conditions. Some may urge that this system produces a man disinclined to undergo what he calls the "drudgery" of the workshops, but others will be as ready to admit that the proper type of youth acquires his practical experience at a much more rapid rate after he has undergone a college training, and has no such disinclination.

This system may be preferred by employers as distinguished from system (2), which may be preferred by teachers.

Other systems are in vogue, either by accident or design, whose object is to avoid the disadvantages connected with "separate" and "combined" systems or to minimize the required period of training.

(Professor Cormack here took up in detail a number of combinations of the previous systems, comparing them, and indicating advantages and objections. In concluding, he asked the Institution if it were not possible, in some way and at least to some extent, to standardize the training.).

Locomotive Boiler Tubes.

BY LAWFORD H. FRY.

In recent discussions of locomotive boiler design it has been pointed out that the efficiency of the boiler is not entirely a question of heating surface. A boiler in which the barrel is so crowded with tubes as to hinder circulation will not evaporate, in a given time, so much water per square foot of heating surface as will a boiler with fewer tubes and better circulation.

To obtain some idea as to the amount of space usually left for circulation a number of boiler designs have been investigated with the results shown in the accompanying tables.

The locomotives on which the figures are based are 100 in number, representing all types and classes. The dimensions are taken from descriptions which have appeared within the last three years in the technical papers, or in the builders catalogues, and they therefore represent currently acceptable American practice.

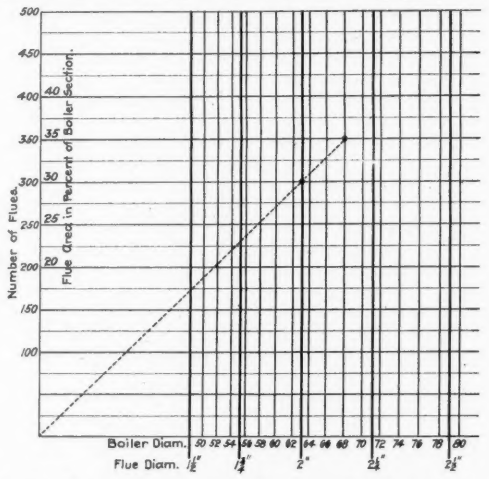


Fig. 1.—Diagram for Calculating the Relation of Flue Section to Boiler Section.

The tables show the proportion of the cross section of the boiler waist which is taken up by the tubes. In each boiler the area of the cross section of the waist is calculated and the sectional area of the tubes is expressed in per cent. of the waist section. The outside diameter of the flues is, of course, used, and for the waist diameter the outside diameter of the front ring, that is to say the inside diameter of the second ring has been taken, following the usual practice of stating the boiler diameter.

The percentage of area occupied by the tubes is dependent not only on the spacing of the tubes in the tube sheet, but also on the position of the fire-box crown sheet in relation to the top of the waist. As the crown sheet can be placed relatively higher in a wagon-top boiler than in a straight-top the wagon-top boilers show a higher percentage of area occupied by flues. The wagon-top and straight-top boilers have therefore been examined separ-

PERCENTAGES OF BOILER SECTION OCCUPIED BY TUBES; GROUPED ACCORDING TO BOILER DIAMETER.

Table 1.—Straight Top Boilers.

Boiler Diameters.	No. of locomotives.	Percentage of boiler section occupied by tubes. Max.	Min.	Mean.
80-78	2	37.8	37.8	37.8
78-76	1	36.6	36.6	36.6
76-74	..	..	..	..
74-72	1	29.9	29.9	29.9
72-70	4	30.7	29.4	30.3
70-68	7	35.3	27.2	29.7
68-66	15	37.4	29.6	32.6
66-64	12	33.8	27.2	31.0
64-62	6	33.5	30.3	31.8
62-60	3	37.2	28.5	32.8
60-58	..	..	..	..
58-56	3	32.0	31.4	31.6
All	54	37.8	27.2	32.4

Table 2.—Wagon Top Boilers.

Boiler Diameters.	No. of locomotives.	Percentage of boiler section occupied by tubes. Max.	Min.	Mean.
80-78	..	..	..	..
78-76	6	30.1	23.4	27.2
76-74	6	26.8	24.6	25.3
74-72	3	30.6	23.1	26.2
72-70	5	33.0	25.7	30.7
70-68	10	32.9	22.9	28.7
68-66	6	32.8	24.8	28.5
66-64	2	29.4	27.9	28.6
64-62	3	31.1	26.8	28.3
62-60	5	36.0	29.2	31.2
60-58	1	25.9	25.9	25.9
58-56	..	..	..	..
All	47	36.0	22.9	28.2

Table 3.—Percentage of Boiler Section Occupied by Tubes, Showing Distribution Amongst 101 Locomotives Examined.

Percentage of boiler section occupied by tubes.	Number of locomotives. Straight-top boilers.	Wagon-top boilers.
23	3	..
24	5	..
25	5	..
26	7	..
27	4	4
28	..	2
29	7	5
30	7	12
31	3	6
32	3	13
33	2	5
34	..	..
35	..	1
36	1	1
37	..	5

Table 4.

STRAIGHT-TOP BOILERS; WITH MAXIMUM AND MINIMUM PERCENTAGES OF TUBE AREA.

Road.	Type wheels.	Class cylinders.	Cylinder dimensions. inches.	Total weight, pounds.	Boiler Diam. inches.	Tubes. Number.	Tubes. Diam. inches.	Per cent. of boiler section occupied by tubes, per cent.
A. T. & S. F.	2.6.2	4-c. com.	17 & 28x28	209,900	70	318	2¼	33.0
E. P. & N. E.	2.6.2	Sim.	21x28	183,900	68	299	2¼	32.9
L. V. R. R.	2.8.0	4-c. com.	17 & 28x30	200,200	66	356	2	32.8
U. P.	2.8.0	4-c. com.	16 & 27x30	188,600	76	337	2	23.4
O. S. L.	2.6.0	4-c. com.	15½ & 26x28	168,900	72	298	2	23.0
B. W. & G. F.	2.8.2	4-c. com.	14 & 24x26	166,900	68¾	270	2	22.9

Table 5.

WAGON-TOP BOILERS; WITH MAXIMUM AND MINIMUM PERCENTAGES OF TUBE AREA.

Road.	Type wheels.	Class cylinders.	Cylinder dimensions. inches.	Total weight, pounds.	Boiler Diam. inches.	Tubes. Number.	Tubes. Diam. inches.	Per cent. of boiler section occupied by tubes. per cent.
A. T. & S. F.	2. 8.2	4-c. com.	18 & 30 x32	261.700	78¾	463	2¼	37.8
do.	2.10.0	Tand. com.	19 & 32 x32	267,800	78¾	463	2¼	37.8
N. Y. C. & H. R.	2. 6.0	Sim.	20 x28	155,200	67¼	366	2	37.4
do.	2. 6.0	2-c. com.	22½ & 35 x28	165,000	67¼	366	2	37.4
A. & W. P.	4. 6.0	Sim.	21 x28	180,000	60	335	2	37.2
G. H. & H.	4. 4.0	Sim.	19 x22	125,700	60	324	2	36.0
C. & G. W.	2. 8.0	4-c. com.	17 & 28 x30	178,400	68	321	2	27.8
O. A. & P. S.	2. 8.0	4-c. com.	15½ & 26 x30	183,900	68	321	2	27.8
Rutland	4. 4.0	Sim.	18½x26	127,000	68	312	2	27.2
C. & E. I.	4. 8.0	2-c. com.	21½ & 33 x30	186,000	64	288	2	27.2

Table 6.—Average Number of Flues in Boilers of Various Diameters, as Found from Investigation of 101 Locomotives.

Boiler diameter.	Number of tubes. Straight-top boiler. 2 in. tubes.	2¼ in. tubes.	Wagon-top boiler. 2 in. tubes.	2¼ in. tubes.
56	219	174	251	198
58	235	186	268	212
60	252	199	288	228
62	269	213	307	243
64	286	227	328	259
66	304	241	348	275
68	323	256	370	292
70	343	271	392	310
72	363	287	415	329
74	383	303	440	348
76	404	320	465	368
78	425	337	491	388
80	447	354	517	409

ately and the average value of the percentages determined for each type of boiler.

It is found that in a wagon-top boiler the sectional area of the tubes is on an average about 32 per cent. of the area of the cross section of the waist, and in a straight-top boiler the tube area averages about 28 per cent. of the waist area.

As will be seen from the tables the ratio of tube area to boiler section is subject to considerable variation, the maximum and minimum values being from 15 to 25 per cent. greater or less than the average values.

There does not appear to be any connection between the class of locomotive and the relative number of flues in the boiler. This is shown by Tables 4 and 5, in which are given some dimensions of those locomotives for which the per cent. of boiler section occupied by the flues shows maximum and minimum values.

Tables 1 and 2 show the figures from which the averages are obtained, grouped according to the boiler diameter. The boiler diameter being taken in groups increasing by two inches, the tables show the number of locomotives considered in each group, and the average area of the tubes in per cent. of the boiler cross section. The maximum and minimum values of the percentage are also given for each group.

Table 3 shows the distribution of the values of the percentages of flue area amongst the boilers examined. Column one gives the percentages between the limiting values of 23 and 37 per cent., and in columns two and three are given the number of straight-top and wagon-top boilers in which the corresponding percentages of flue area are found.

In the case of the wagon-top boilers the majority examined show tube area percentages between 29 and 34 per cent., while in the straight top boilers the percentages are fairly evenly distributed between 24 and 32 per cent.

Table 6 shows the numbers of flues which in boilers of various diameters correspond to the average percentages of 28 per cent. for straight and 32 per cent. for wagon-top boilers. For those who wish to carry this investigation further the diagram of Fig. 1 has been prepared, to facilitate the work of calculating the relation of flue section to boiler section. For example, in a 68 in. boiler with 350 2-in. flues to find the percentage of boiler section occupied by the flues. The intersection of the vertical for 68 in. boiler diameter with the horizontal for 350 flues is found, and through this point a diagonal is drawn to the lower left hand corner of the chart. This line meets the vertical for the flue diameter (2 in.) in a horizontal which gives on the left hand scale the percentage required. In the above case it will be seen that the diagonal crosses the 2-in. vertical on the 30 per cent. horizontal.

As mentioned above, the relative height of the crown sheet is variable and consequently this method of comparing the tube spacing by calculating the percentage of boiler actions occupied is not rigidly correct. It will, however, serve to give a good general idea as to whether the closeness of the tube spacing is above or below the average, and in boilers having the same heating surface the presumption is that a lower percentage of occupied section will indicate better circulation and greater freedom of steaming.

The percentages and diagram for calculating them will also be found useful in determining approximately the number of tubes which can be placed in a boiler of given diameter without undue crowding, and it is for this purpose that Table 6 has been prepared.

A New Hospital Car.

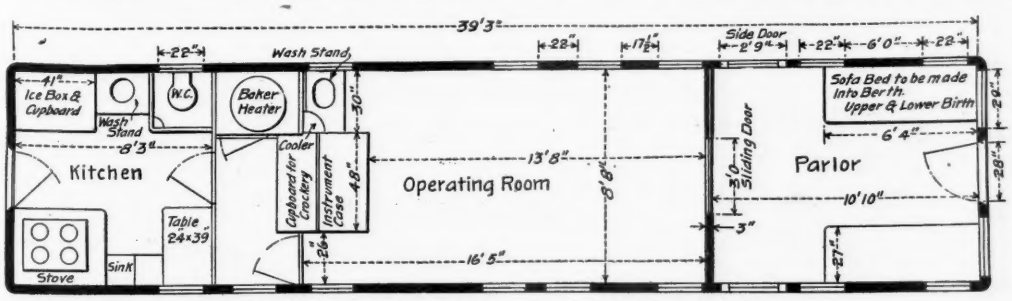
A hospital car has recently been put into service on the Galveston, Harrisburg & San Antonio. The arrangement of the car is shown by the accompanying plan.

The car consists of a parlor and sleeping compartment, an operating room and a kitchen. The parlor has two lower berths, similar to a double Pullman section, and also has room for two cots if necessary. A box under the bottom of the car is capable of holding six combination cots and stretchers.

The operating room has plain walls and ceiling, enameled white. The only furniture is a steel enameled operating table and two combination folding cots with tubular steel frames. The steel instrument cabinet is built into the car, making a very durable cabinet for surgical instruments and dressings of all kinds. Another cabinet is built above this for additional supplies of dressing material, splints, etc. The wash basin and water cooler is built into the niche at the side of the instrument cabinet. The operating room can accommodate six cots. The third compartment contains the kitchen, Baker heater, ice box, cupboard and considerable shelf space.

The car is easily heated and is well lighted. Oil lamps and acetylene gas are used for lighting. For night work acetylene is especially desirable. The car has 32-in. side doors for the easy entrance and exit of patients on a 28-in. or 30-in. stretcher. The road has been fortunate in not having many wrecks since the car was put in commission, but the few times it has been used demonstrate its usefulness. The patients do not require much handling to get them into the car and wounds can be dressed before reaching the hospital. By the use of combination cots, the injured can be taken directly from the car without changing cots, thus avoiding unnecessary and painful handling. If the wreck should occur at a great distance from the hospital, and there is much delay, an operation could easily be performed in the car.

The above information has been furnished through the courtesy of Messrs. W. G. Van Vleck, Second Vice-President and Manager, and R. W. Knox, Chief Surgeon.



Hospital Car for the Galveston, Harrisburg & San Antonio.

A German Study of the Labor Question.

At the 44th general meeting of the Association of German Engineers, at Munich, Professor Gustav Schmoller delivered an address dealing with the effect which advances in technical knowledge have on the well being of the people. His remarks on labor conditions, past, present and future, are given below, and are of interest as the views of a well informed political economist who has studied engineering conditions.

When the first large manufactories were established, about 1770, labor was plentiful and the conditions evil. From 1770 to 1850 there was a surplus of workers which pressed down the wages, and yet they crowded from the country to the towns so that what with low wages and long hours, improper sanitary conditions in shops and dwelling places, and lack of education, the manufacturing districts of the towns sunk to a low moral and physical level. These conditions, reaching their climax from about 1815 to 1860, developed social unrest, class hatred, and socialistic theories, and led to some laws regulating the hours of labor and protecting the workmen, and some agreements between the employers and organized labor.

In the last fifty years there has been a slowly begun regeneration of labor conditions, as Karl Marx phrases it. The best results in this process have been attained where increased wages leading to better education and nourishment and a conscious organization have done the most towards improving the labor conditions. This has been chiefly found in trades where increasing technical skill has made the labor more intelligent as, for example, in the printing, and in the machinery and iron trades. With advances in his condition the workman has become less docile and less patient of the patriarchal control of earlier times. He has become an independent citizen, reading his own newspaper and voting for his own political candidate, but he is not prepared to renounce the utopian socialistic ideas which have led him to the struggle for better things. Beliefs are always treasured most highly, and it is well that it is so. The workingman is too often easily led to abandon his honorable, capable and self-sacrificing leaders, and follow demagogues and agitators. He has not known enough history and politics to keep him from hoping for a political revolution as did the liberals of the common people throughout Western Europe from 1789 to 1860.

It would at the present time be profitless to attempt to take from the social democrats and from organized labor their leaders and their ideals, and to make a complete conversion. Progress can only be made by leaving to them their Utopian ideals, and at the same time by treating with them in a practical manner, and by endeavoring to improve the conditions of the hours of labor, of female and child labor, of methods of payment and of the education of the children. The trade unions and the right of combination must be respected, but by an improvement of the laws the darker side of unionism must be improved. It is only slowly and step by step that normal labor conditions can be reached. It is, however, not difficult, and it is a necessary condition for victory in the markets of the world. If the advantage in social redemption is left to the Americans and the English they will be the victors.

This redemption is facilitated by the fact the large individual firms are being replaced by limited liability companies and combinations. Business is no longer governed by individuals and their passions, but by directors and officials. The large companies in addition to their laboring force have built up a force of officials, engineers, chemists, salesmen, foremen and clerks of all classes. The number of private officials in Germany grew in the years 1882 to 1895 from 307,268 to 621,825, and by this time may well number a million, which considerably exceeds the number of State and municipal officials.

In these classes there is also a social fermentation in progress, a struggle for larger salaries, better treatment and a greater economical security. The rearrangement of conditions and the social redemption will here be more easily successful than among the working class and will serve as a pattern for the treatment of the labor question. The laws devised will be extended for the protection of labor as in the case of the Government railroads and other works where many thousand workmen have been raised to the official class. Where this is not the case the labor organizations must educate their members, teaching them obedience to their chosen leaders with whom the employers can deal, and with whom reasonable contracts as to work and wages can be made.

All of the large undertakings will gradually assume the character of semi-public institutions, and in addition to the large business questions the great social questions will take more and more importance. The larger and more stable these institutions become, and the more they take the character of assured monopolies, the more will they be in a position, as are now the State and the municipalities, to protect the interests of their employees and they will do this to ensure for themselves the best class of labor. And so—but the time will be long—will be relieved the social pressure which now bears upon us.

To sum up in allegorical form, the Age of Mechanical Industry has built for humanity a new and infinitely improved dwelling house. But the parties and classes have not yet discovered the rules of life for the proper occupation of the house. They are struggling for the rooms instead of recognizing that their first effort should be to become better and wiser so as to properly utilize the new conditions.

The American Locomotive Company.

The annual report, of which a brief summary appeared in these columns last week, is issued in a 40-page pamphlet, and in form and substance makes a model for all industrial corporations whose securities are distributed among the public. Mr. Callaway's training as a railroad officer makes it natural that full detailed information should be expected, nevertheless it is creditable that it should be so well done. The sum of it is that they did a business of 33 million dollars at a cost of 28 millions; divided a million and three-quarters; and spent more than a million and a half in betterments (all of which are listed in the report). The gross earnings increased 25 per cent., and the expenses increased 20 per cent. Mr. Callaway says:

The increase in the company's gross earnings is attributable to a much larger product rather than to higher proportionate prices. The officers have conscientiously avoided any advance in the selling price of engines other than such as became absolutely necessary in order to meet the higher cost of labor and of raw material.

It is the company's intention to make a prominent feature of the general overhauling and extensive repairing of locomotives and the supplying of new parts; hence it it is gratifying to be able to report the substantial growth of this department during the year.

The increase in expense has not been in proportion to that in earnings, inasmuch as the economies introduced during the past two years are now beginning to bear fruit; these, however, do not show to their full extent, as in pursuance of the company's liberal policy in the matter of the up-keep and betterment of its plants, the charges to productive cost for maintenance, renewals and replacements were double those of the preceding year.

There can be no doubt that this conservative course will speedily accrue to the benefit, not only of the company itself, but of its customers as well. The company's organization is being perfected in all departments as rapidly as possible and particular attention is being paid to the compilation of records which are the basis of the cost sheets. The officers fully understand that only through the most intimate knowledge of the cost of every item can they hope to reduce the expense of manufacture as a whole; and it is a firmly established principle with this company that costs must be promptly and radically reduced. The directors are confident that adherence to this policy will justify the continued good will and clientage of the railroad companies which are its patrons. Had it not been for the abnormal rates paid, in many instances, for labor, as well as for the exceptionally high market prices governing raw material, the desired reduction in the selling price of the company's product would have been accomplished sooner; for the company wishes it to be understood that it considers itself committed to the policy of allowing its customers to participate with it in the benefits which are to be derived from all reductions of manufacturing costs. Meantime the constant efforts of the shop superintendents and mechanical engineers to utilize to the best advantage the company's increased facilities and improved machinery and to unify the shop practice, continue with unabated zeal; so that during the ensuing year it is reasonable to expect that still greater economies will be effected, to the mutual advantage of the company and those who purchase its product.

In order to take advantage of the exceptional and widespread demands for new locomotives during the past two years, extensive purchases of land have been made, capacious new shops of the most modern design have been erected and equipped with the latest and most efficient machinery and tools. Old shops have been remodeled and re-equipped, with the result that the manufacturing ca-

pacity of the company has increased fully 50 per cent. over that of the constituent plants at the time of their consolidation into the American Locomotive Company. It is expected that the improvements authorized by the Board of Directors will be completed during the fiscal year now opening.

The profit on the increased output, which was alone made possible through these additions, has yielded the company a highly satisfactory return on its investment. All this has been accomplished without increasing the capital account.

The company now carries on its books binding contracts for a large number of locomotives for delivery as late as the summer of 1904, all of which it is confident of being able to deliver in strict accordance with its promises.

New Locomotive Shops of the Chicago, St. Paul, Minneapolis & Omaha at Sioux City.

The new locomotive shops which the Chicago, St. Paul, Minneapolis & Omaha has just completed at Sioux City, Iowa, replace the shops located about a half-mile south of the new plant, which have been in service about 40 years. The old plant includes the car department, and will be used entirely for car repairs hereafter.

The site of the new plant, which is a tract of about 80 acres, required considerable preparation to put it in condition for shop purposes. It is on the west side of the Illinois Central, on whose tracks the Omaha enters Sioux City, and included part of a high bluff approximately parallel to the railroad. The latter passes the point on a fill, between which and the bluff was a considerable depression. About 200,000 cu. yds. of excavating was done, the material removed from the bluff being used to fill the depression up to the grade of the Illinois Central. The line of the Sioux City Traction Co. also ran through the tract between the railroad and the bluff, and a mile and a half of its track was diverted to pass around the west side of the shop property, and of some new switching yards which have been put in north of the shops.

The new plant comprises a machine, erecting and paint shop under one roof; boiler and blacksmith shops, also under one roof, and on the opposite side of a transfer table from the machine and erecting shop; storehouse and office building; central power station; and engine house with coaling, sanding, watering and ash-handling facilities. All of the buildings are brick, with concrete foundations on piling.

The power house is 60 ft. x 96 ft., with a height to truss of 20 ft. 9 in. The trusses, which rest on pilasters in the side walls, are of composite construction, and the roof is slate over 2 in. x 6-in. sheathing on 3 in. x 12-in. purlins. A transverse partition divides the interior into power room, 40 ft. x 57 ft. 4 in., and boiler room, 52 ft. x 57 ft. 4 in. Over each is a monitor 38 ft. long and 8 ft. wide, with louvre sides, and four skylights 6 ft. x 13 ft., two on each side of the monitors. The stack is 5 ft. 6 in. inside diameter and 125 ft. high. It is brick on a foundation of rubble masonry over a footing course of concrete resting on piles. The rubble masonry is 15 ft. deep, and the concrete 2 ft.

Outside of, and adjoining the power-room end of the station, is a well and pump room 20 ft. wide and extending the width of the house. Its floor is 11 ft. 4 in. below the power room floor, and the roof is flat, starting from just below the power station windows and sloping toward the outer wall of the pump room. There are two skylights, 8 ft. x 15 ft., in the roof, and midway is a sort of monitor, 10 ft. wide and 9 ft. 6 in. high, covering the stairway and door leading to the power room.

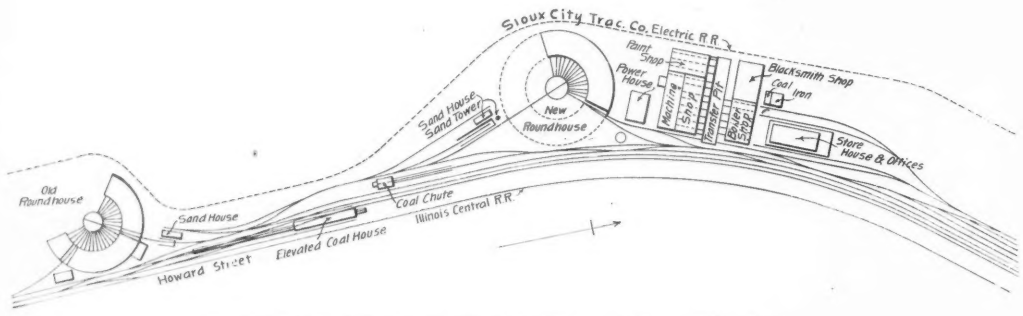
There are three 150-h.p. Heine boilers to carry a maximum pressure of 160 lbs.; also space for two additional. Coal is delivered in cars on a track along the east end, and is shoveled into the boiler room, a space of 26 ft. 8 in. between the boilers and the east wall affording storage space for three cars. The ashes are dumped into a sort of bucket car, running in a trench in front of the boilers. It passes through an opening in the south wall, where it is picked up by a crane and emptied into a car.

The power room contains two units composed of 14 and 24-in. x 14-in. Westinghouse compound engines, direct connected to 125-k.w., 220-volt, two-phase generators, with space for a third unit; and a 500-ft. Ingersoll-Sergeant class G air compressor, having 12-in. x 14-in. duplex steam cylinders, and 16¼-in. x 10¼-in. compound air cylinders. The compressor is one that had been used at the old shops.

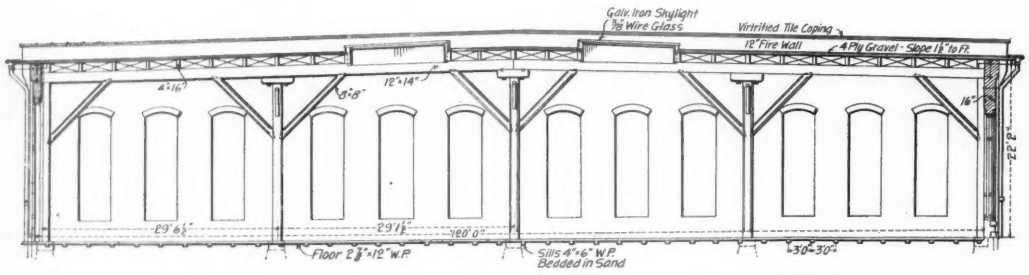
In the pump and well room are three Blake duplex pumps, a 950-h.p. Cochrane feed-water heater, the air receivers, and a washout tank for locomotive boilers. Two of the pumps are 12 in. x 7 in. x 12 in., and will give pressure up to 300 lbs., one being for washout and fire, and the other for fire and service. The third is 8 in. x 5 in. x 12 in., for boiler feed, giving 125 lbs. pressure. The three are so piped that in case the two high-pressure pumps should become unavailable for fire service, the boiler-feed pump can be put on the fire line.

Hot water is used for washing out and filling all locomotive boilers. The suction of the washout pump connects to a 4,500-gal. tank made of ¼-in. tank steel, the water in which is heated by exhaust steam. There is also a live-steam connection for use when needed. The water supply is controlled by a float-valve.

The leads from the exciters to the generators and from the latter to the switchboard are carried in 8-in. iron-pipe conduit laid under the power room floor, which is tiling. The switchboard is marble and has three panels, for light, power and generators respectively. The distribution leads pass up the wall of the station and through same to a double bracket on the outside, from which they run off to the yards and buildings. The light and power for all of the buildings are controlled from the machine shop, there being cut-out boxes and independent switches on the inside of the south wall of same.



General Plan of C., St. P., M. & O. Shops at Sioux City, Iowa.



C., St. P., M. & O. Shops—Transverse Section of Machine and Erecting Shop.

The number of locomotives tributary to these shops is 140. The erecting shop contains eight pits, and the area of the machine shop is approximately 12,000 sq. ft., or 1,500 sq. ft. per pit. The pits have concrete side and end walls, and bottoms composed of a base course of concrete laid over with brick. Locomotives are wheeled and unwheeled on a drop-table. The table is driven through gearing by a 30-h.p. motor sitting on the shop floor, the location being shown on the plan of the shop. The travel of the table is limited by oil switches moved by a trip on the table.

All tools in the machine shop are motor-driven, there being seven groups including the tool room, and six individual drives; the proportion of the latter being 22 per cent. The heavy work originates at the east side of the shop and the tools for same were arranged accordingly. Pistons, cross-heads, driving boxes, etc., will go first to the heavy lathes in group 1, next to the planers, etc., in group 4, and thence to the central track for distribution. The light brass lathes are in group 6, convenient to the air-brake and pump repairs space, while the heavier brass work is done in group 3. None of the line-shafting exceeds 25 ft. in length, except that for group 5, which was extended to drive the grind-stone and slotter on the west side of the office. The motors for the tool room and groups 3 and 6 are on shelves resting on brackets secured to the wall. The remaining group motors are on the floor. A list of all the tools is annexed, giving the tools in each group, with their numbers, estimated horse-power, and the size of motor for each. Twenty per cent. of the estimated horse-power of each group is added for the shafting. The aggregate horse-power of motors in the machine shop is 100, exclusive of the drop-table.

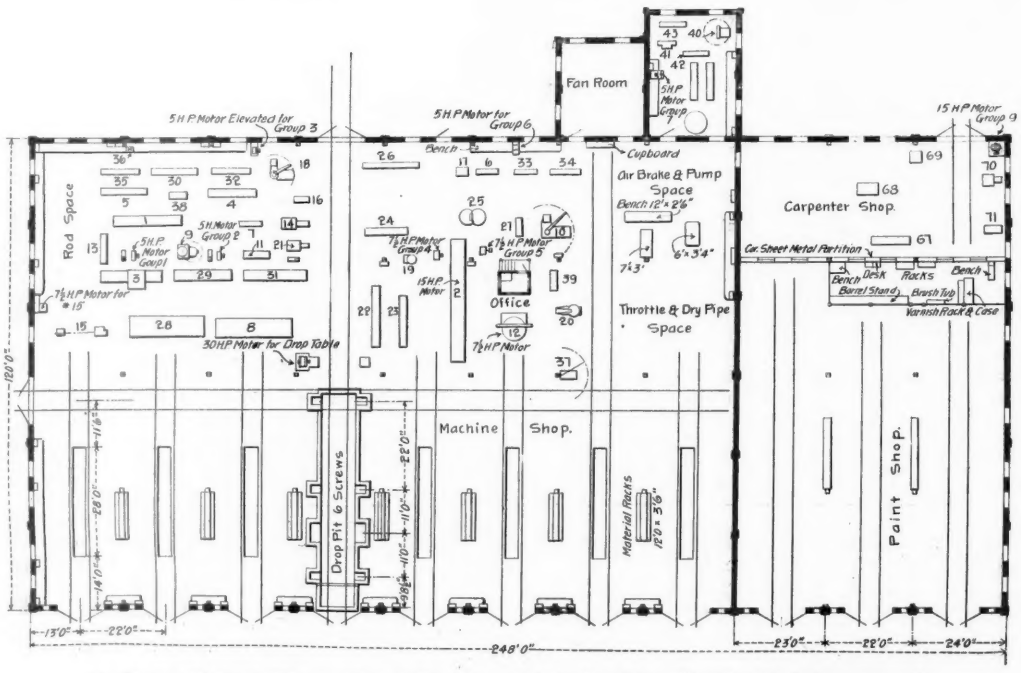
Only a part of the tool equipment is new. Several of the individual drives have been adapted to old tools. Illustrations are shown of two of these, one being a Niles 84-in. wheel lathe, and the other a Niles 72-in. boring mill. The motors with their attendant gearing and cones are bolted to a cast-iron bed-plate supported on framework, secured to the frame of the tool. For the lathe, the framework is made of 4 in. x 3 in. x $^{7}/_{16}$-in. T-iron, braced by 1½ in. x 1½ in. x ¼ in. angle iron. For the boring mill 4 in. x ¾-in. wrought-iron brackets secured to the housings, support a shelf made of 2½-in. white pine, on which the bed-plate rests. The bed-plates are on rails, with adjusting bolts for belt-tightening.

The shop is served by air hoists. A 1½-ton hoist travels the length of the shop in front (north) of the erecting pits. The driving-wheel press and the 72-in. and 84-in. driving-wheel lathes have each a 5-ton hoist, which travels from the central track to the tool. One of 2-tons capacity travels from the track to the rod section, serving intervening tools, and a small one (½-ton) is over the rod bench. Another of 2 tons makes a circuit of the section between the two transverse tracks, serving all tools.

The paint shop, in the same building with the machine and erecting shop, has three tracks. The rear end is partitioned off for a carpenter shop, and contains several tools, motor driven and forming group 9.

The transfer table serving the erecting and boiler shops is of 100 tons capacity, is 35 ft. long and has a travel of 270 ft. It was furnished by Geo. P. Nichols & Bro., Chicago.

The boiler shop has six tracks and an area of 9,200 sq. ft. The motor-driven equipment is given in the tool and motor list. There are three individual drives, and the rest of the tools are driven in one group from a 15-h.p. motor. Near the northeast corner of the shop is a small building, 15 ft. x 20 ft., in which the flues are cleaned. It contains an Otto flue-cleaner. The blacksmith shop has about 8,600 sq. ft. of floor space. Included in the



C., St. P., M. & O. Shops—Plan of Machine and Erecting Shop Showing Tool Arrangement.

equipment are a No. 7 Sturtevant blower and an Ajax bolt-header, both individually motor-driven.

The storehouse is to carry supplies for this plant only, and is a one-story building, 60 ft. x 164 ft., with a platform 10 ft. wide on each side, and extended to 40 ft. at the north end. The offices of the shops and of the Assistant Superintendent of Motive Power are in the south end of the building.

Fifteen stalls of the new engine house have been built, to supplement the older house of 25 stalls lying to the south. Engines enter both houses from the south, and pass out to the north, each house having its separate ash-pit and sand house. The new house is brick and wood, the roof, which has a slope of 1 in. per foot each way from the center, being carried by a double row of 12 in. x 12-in. timber columns. There is no overhead lighting. The back wall has two windows per bent, and at the front each door contains a window. The smoke-jacks are the Roe pattern. Over each pit is a 1¼-in. pipe passing through the roof, for blowing down engines having a full head of steam. In each pit is a 2-in. blow off pipe leading to an underground drum outside of the house, intended to intercept sediment and other matter that would otherwise be blown into the sewer. There is a drop-pit for driving wheels. The turntable, which is 70 ft., is to be equipped with some sort of power drive.

The new coaling station is a Fairbanks-Morse, with a gasoline engine to draw cars up the incline. There is storage capacity for three cars of coal, and six discharge pockets, three on a side.

The ash-pit is of the pneumatic type, and is the standard of the road. Small cars on wheels run under the locomotive track, each on a track transverse to, and with a slight incline toward it. When loaded, they are drawn from under the locomotive track, raised by overhead air hoists carried on steel framework, and dumped into cars. Each roundhouse has a sand tower, which is a steel tank having a sand capacity for about six locomotives, supported on a steel frame. The sand is elevated by compressed air.

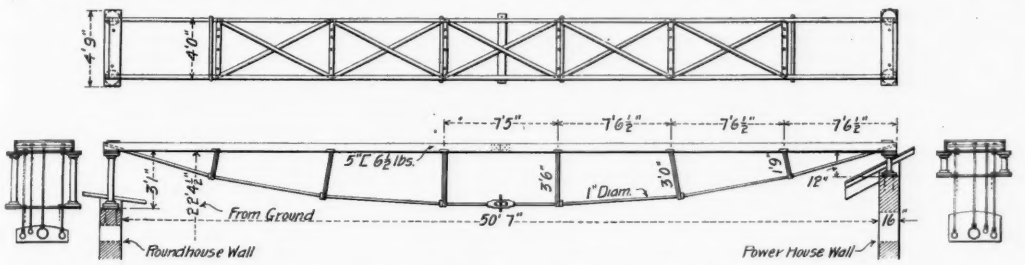
All buildings, except the storehouse, which has direct steam, are heated by the Sturtevant hot-blast system, using exhaust steam. The distributing ducts are galvanized iron, placed overhead. For the roundhouse, branches drop down the columns, connecting to tile ducts underground, which discharge into the pits at the sides. The condensation from the heating system is all returned to the Cochrane heater in the power station, the oil being separated from the steam before it goes to the heating coils. The exhaust from the fan engines is also run through the heating coils, and each fan-house has a small separator for removal of the oil from this steam. The oil is strained and used again.

The piping for the heating system, and for live steam supply where needed, is all carried overhead. For supporting it between buildings specially-designed bridges have been put in. A drawing of one of these bridges is shown. They are supported on the building walls by columns resting on top of the latter, this feature being necessary to give the desired head room. The bridges are made of two parallel channels, laced across, and trussed for vertical stiffness. The piping is supported from them by adjustable hangers. There are four of these bridges, the one between the machine and boiler shop having a span of 83 ft.

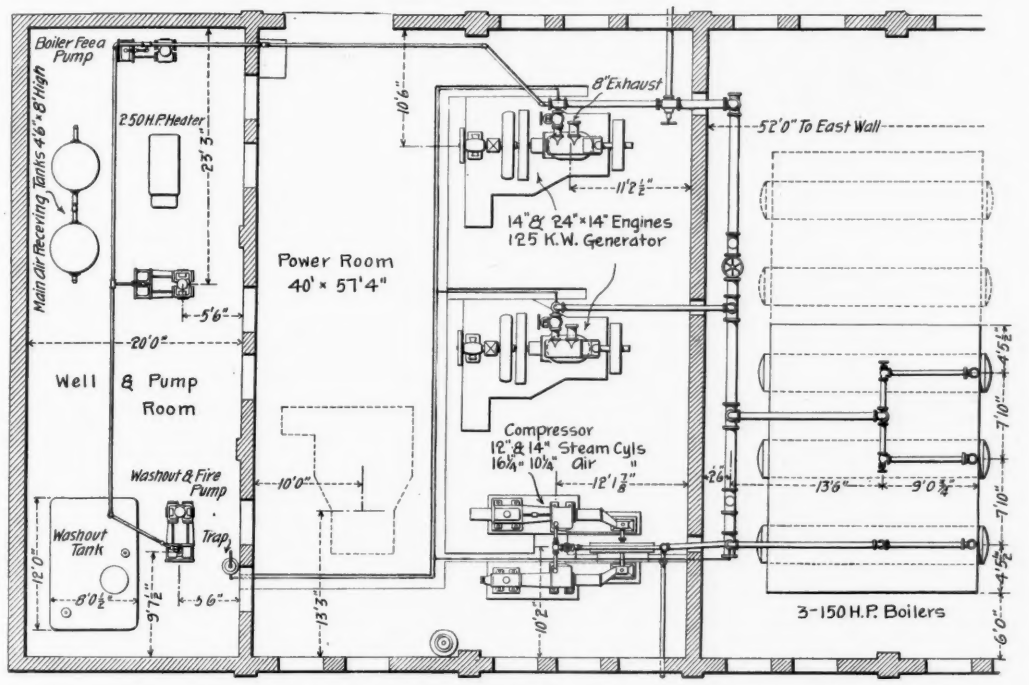
The lighting is by 2,000-c.p. enclosed arc, and 32-c.p. incandescent lamps, there being 46 of the former, and 223 of the latter. Of these, 15 arcs and 64 incandescents are in the machine shop.

The water supply is obtained from three wells on the property. The city line is to be cut in for supplementary and emergency use.

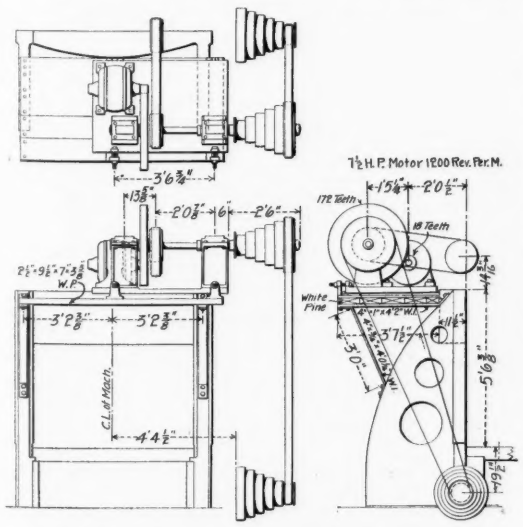
Acknowledgments are due Mr. J. J. Ellis, Superintendent of Motive Power and Machinery, and Mr. B. R. Moore, Mechanical Engineer, through whose courtesy this description is presented.



C., St. P., M. & O. Shops—Bridge for Supporting Overhead Piping Between Buildings.



C., St. P., M. & O. Shops—Plan of Power Station.
(Plan shows steam piping only.)



C., St. P., M. & O. Shops—Individual Motor Drive Applied to 72-in. Boring Mill.

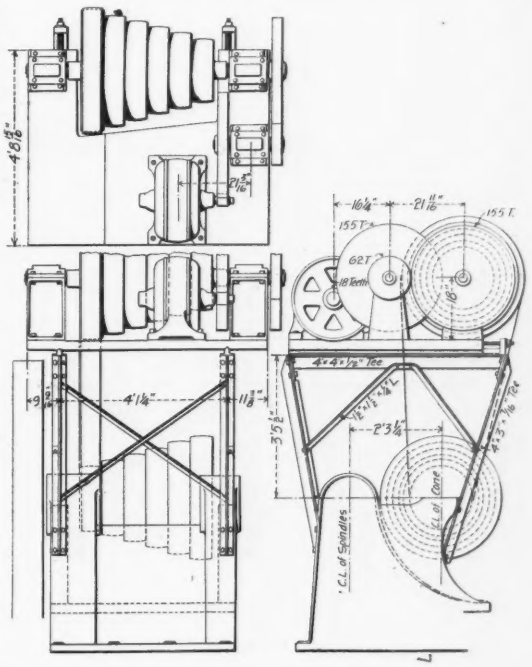
TOOL AND MOTOR LIST.

Machine Shop.

Individual Tools.

Number.	Machine.	Estimated horse-power.	Horse-power of motor.
1	Pond 36-in. x 36-in. x 12-ft. planer	7½	7½
2	Pond 48-in. x 16-ft. planer	15	15
3	Pond 48-in. x 16-ft. lathe	5	5
8	Niles 84-in. driving-wheel lathe	10	10
12	Niles 72-in. boring mill	7½	7½
15	Niles 72-in., 100-ton driving-wheel press	7½	7½
28	Bennett 79-in. driving-wheel lathe	7½	7½

Group No. 1.		
5—Niles 22-in. x 12-ft. lathe	1½	
13—Morton 30-in. shaper	2½	
29—Niles 42-in. lathe	3	
30—Pond 24-in. lathe	1½	
35—Fifield 16-in. lathe	1	
36—Emery wheel	1	
	10½	5
Group No. 2.		
7—Niles No. 2 screw machine	1	
9—Sibley & Ware 20-in. drill press	1	
11—Sellers cotter drill	1½	
14—Acme 2½-in. bolt-cutter	1	
21—Acme 1½-in. bolt-cutter	½	
31—Putnam 36-in. lathe	3	
	8½	5
Group No. 3.		
4—Lodge & Shipley 30-in. x 12-ft. lathe	2½	
16—Hurlbut 3-in. cutting-off and centering machine	1½	
18—Radial drill	3	
32—Putnam 24-in. lathe	1½	
38—Grind-stone	1	
	9½	5
Group No. 4.		
24—Niles double-head axle lathe	3	
25—Niles car wheel boring mill	5	
26—Niles 100-ton wheel press	3½	
	11½	7½
Group No. 5.		
19—Putnam 30-in. drill press	1	
20—Niles 14-in. slotter	5	
22—Putnam 24-in. x 30-in. x 10-ft. planer	5	
23—Pond 23-in. x 30-in. x 11-ft. planer	5	
39—Grind-stone	½	
	16½	7½
Group No. 6.		
6—Fox 18-in. turret lathe	1	
10—Niles 72-in. radial drill	4	
17—Gisholt universal tool grinder	2	
27—Emery wheel guide grinder	3	
33—Niles 14-in. turret lathe	1	
34—Putnam 18-in. brass lathe	1	
	12	5
Group No. 7 (Tool Room).		
40—Universal milling machine	2½	
41—Landis universal grinding machine	3	
42—Putnam 14-in. shaper	4	
43—Brown & Sharpe 16-in. lathe	1	
	10½	5
Boiler Shop.		
45—80-in. bending rolls (individual)		15
54—Long & Allstatter No. 2 punch and shears (individual)		7½
44—Acme 2-in. single bolt-cutter	1½	
47—Grind-stone	½	
48—Tube cutting-off machine	½	
49—Hartz tube welder	8½	
50—Otto tube cleaner	6	
52—36-in. drill press	1½	
53—6-in. emery wheel (double)	1½	
	20	15
Smith Shop.		
61—Sturtevant No. 7 blower (individual)		10
62—Ajax 1½-in. bolt header (individual)		5
Carpenter Shop.		
67—Fay & Egan column bracket cut-off saw	10	
68—Fay & Co. No. 2 standard rip saw	10	
69—Fay & Egan No. 2 car mortiser	7½	
70—Fay & Egan No. 50 band saw	5	
71—Grind-stone	1	
	33½	15
Total estimated horse-power (of groups)		132½
Total horse-power of motors (for groups)		92½



C., St. P., M. & O. Shops—Individual Motor Drive Applied to 84-in. Wheel Lathe.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 83 Fulton Street, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The solution of a great problem, such as the present labor question, is helped by those in a position to help, only by a strict adherence to the principles of liberty, a respect for others' rights and a strict obedience to law, and with full information of passing events and a knowledge of the history of like struggles in this and other countries. In these columns this week there are three contributions to the discussion which tend to help those who are watching judicially and intelligently. The President of the United States, the workingman's friend, if any one is entitled to be so called, an honorary member of the Brotherhood of Locomotive Firemen, vehemently but soberly denounces the class distinction insisted upon by trade unions generally, which denies the right of the non-union man to work. He says, "It is an infamous thing in our American life and fundamentally treacherous to our institutions to apply to any man any test save that of his personal worth, or to draw between two sets of men any distinction save the distinction of conduct." As a passing event, a glance at our record of trade union outrages for the month of July is instructive in this connection. The extract from the address of Professor Schmoller before the general meeting of the Association of German Engineers, is well worth reading in this same connection; that is, as a record of what has occurred in Germany during the past one hundred and thirty years, and their fear of American supremacy in manufactures, due to a possible earlier solution of the labor question in this country.

The Lessons of the Newark Crossing Collision.

On February 19, last, a trolley car of the North Jersey Street Railway Company slid, beyond control of the motorman, down a sharp grade in Clifton avenue, Newark, N. J., and met a passing train of the Delaware, Lackawanna & Western with dreadful results. Nine were killed and many were injured. On April 3, in these columns, was published the Coroner's jury's verdict arraigning both corporations for gross negligence, and its aftermath was the indictment and trial in Newark last week of eminent directors of the Electric Railway Company, among them Mr. A. J. Cassatt, President of the Pennsylvania Railroad. That such men, the value of whose time is hard to rate, should be compelled to spend two days facing a jury, and charged with a statutory crime, is proof that we live in a land where all men are born free and equal, and some stay so. The charge was manslaughter, based on a neglect to provide grade-crossing safeguards, and to provide and enforce rules to prevent such calamities. When the prosecution rested its case the Court ordered the jury to acquit; and while the reasons given by the Court are substantial and just, nevertheless the future needs to be looked after, and railroad directors and officers have a serious problem before them in dealing with trolley crossings.

Three safeguards may be considered: (1) Sanding the track; (2) a derailing switch, and (3) separation of grades. With only a moderate descent toward the railroad, with cars in good order, and capable and well-trained motormen and conductors, the provision of adequate sanding apparatus, with a supply of dry sand, may be called a fair provision against emergencies. The Court seems to have based its decision largely on the fact that for two years all the motormen had run their cars down this grade without ever losing control of them. This was looked upon as conclusive that the company's rules were sufficient for safety. If the rails had been sanded the collision would not have occurred. The men responsible for not using sand or for not having a supply on the car on February 19 were not on trial, and the Court could not deal with them.

As to derailing switches, the Court held that as only one in ten crossings of this kind have derailers the prosecution had failed to show that this company was negligent in not providing one here. What territory or what classes of crossings were included in finding this percentage we are not informed.

The third remedy, to put the street either above or beneath the railroad, appears not to have been considered. Naturally it would not be, as this is the most costly and slowest remedy to apply, and failure to apply it where needed, although an offense against society, is one for which the responsibility is scattered. The people of Newark are bitter in their disappointment in the failure to fasten crime on the railroad officers, but the fault is surely chargeable to themselves and their neighbors. People will be killed and property destroyed by grade-crossing accidents as long as such crossings are traversed by fast trains. No precautions and no discipline will entirely prevent them, although both of these rational treatments will largely reduce the number of them. In this case under discussion the guilt lies at the door of the State government. Massachusetts is the one State which is wisely, economically and humanely eliminating this class of accidents from our lists. The people of the State of New York are trying to do the same, but have lately been baffled by their Governor, as we have had occasion to point out. Illinois is giving the subject attention, so far without results; but the end is sure over this entire enlightened country.

A large proportion of engineers, conductors, motormen, train despatchers and other men tried in the courts for causing accidents go free because facts do not fit the legal crime, or because other persons, not on trial, are clearly seen by Court and jury to be equally blameworthy. When a crime is created by statute the courts properly require a strict construction. All of the elements of such statutory crime must be shown to exist or the accused must go free. Failure to put in a derailing switch could not, probably, be proved a criminal offense against an individual if 90 per cent. instead of 10 per cent. of the crossings of the country had them; and much less would be the chance if six or eleven men were tried for an act, or a failure to act, with which they were connected through the medium of one or more subordinate executive officers. If the superintendent or chief engineer is chargeable with some misconduct or neglect for which the directors are not responsible, the duty of the prosecution would seem to be to proceed against the individual officer separately.

In estimating the culpability of a person who is on trial under a statute which may send him to State's prison, the Courts will always take a lenient view of the "state of the art" which the accused has neglected to follow. Take, for illustration, a derailment of a freight train due to inadequate brake power. The Courts would say that a train equipped with air-brakes for 75 per cent. of its length, with the apparatus in fairly good condition, in charge of an engineman of two years' experience who had never before got into such a difficulty, was a lawfully conducted train; no one would be jailed or fined for a fatal accident due to failure to stop it within a reasonable distance. But while the Courts usually so rule the railroad superintendent quickly and properly decides differently. He might have evidence that with all the cars airbraked, with fewer leaks in pipes and larger reservoirs, and with an engineman whose reliability rested wholly on skill and not 25 or 50 per cent. on good luck, the stop would have been made in a shorter distance, and the derailment prevented. And, what is more to the point, he would decide that the correction of these deficiencies was the present available preventive of such losses in the future.

The same difference between what the law requires and what good management dictates may be seen in the case of a crossing collision. The trolley car superintendent who intelligently wishes to make sure that his road will not kill nine schoolgirls next February takes certain very definite measures. He has the sand boxes of the cars regularly attended to by a responsible man and that man is not allowed to lapse into carelessness by having his work go uninspected. Motormen are selected with care, are examined by two or more officers and are instructed methodically; they are periodically re-examined, and the superintendent knows by test whether a motorman is likely in an emergency to forget that there is a sand-box on the car.

In deciding whether or not a derailing switch will be useful the energetic and thoughtful superintendent is not so much concerned about the proportion of roads using them, or of crossings equipped, or the probable lenient views of courts and juries; rather he aims to learn the results of the experience of those who have used them and have systematically sought to make of them efficient safety appliances. The testimony of one company which has used a dozen derailers for two years, carefully observing the results produced by their existence, is worth any amount of information about roads which have not yet taken action in the matter. The superintendent who is fully informed about derailers and who has the necessary money, probably uses them; at any rate he will be able if he does not use them, to give definite reasons for the stand which he has taken. Where a company postpones such an improvement two or three years solely because of the expense, the question arises whether the directors, and the executive officer who recommended the expenditure, properly understand their duties to each other.

The safety of passengers demands that cars be surrounded with the best safeguards that experience and skill have devised and that a reasonable expenditure of money and brains will provide; but neither Newark nor any other community can expect to secure this high standard solely by appeals to the law courts and juries—they should eliminate grade crossings.

The Use of Freight Cars as Storehouses.

The demurrage rules recently issued by the North Carolina Corporation Commission contain one good idea; the rule requiring the allowance of extra free time to consignees living more than five miles from the station stipulates that to secure the benefit of this allowance the consignee must exercise due diligence. There are other commendable things in these rules, besides a lot that are not commendable; but this particular point is worthy of notice because it embodies a principle which, if universally applied, would almost make demurrage rules unnecessary. If consignees would only use due diligence in unloading cars they would come pretty near to satisfying the railroads, for that is the only measure that can be applied by the railroad to its own efforts to satisfy the customer.

Putting aside the particularly good and the particularly bad rules of this code, the only thing to be said about it is that the whole thing is unnecessary, because unworkable. Like certain statutes, the code will do some good by curing occasional cases of injustice here and there; but with the great mass of transactions it will simply have to be ignored. Rule X, for example, fining the railroads a dollar a day for delaying cars in transit, must be practically worthless to aggrieved shippers, for it requires an average speed of only 15 miles *a day*. If a railroad is to be punished for moving goods slower than that, a penalty of a dollar a day for each car is so small as to be ridiculous. Like the Missouri mule-driver whose team got stuck in the mud, the shipper could not get much satisfaction except that afforded by swearing, and that remedy would be "inadequate to the occasion."

In refreshing contrast to these inflexible and unpractical measures of the North Carolina State authorities are the recommendations of the *American Lumberman* to lumber dealers who do not like the railroads' way of collecting demurrage. The editor of the *Lumberman*, after conferring with his constituents, discovers that he is able to see through a board, if it has a large knot-hole in it, and he advises his readers to curry favor with the station agents. Finding that often a demurrage bill is abated, or even entirely withdrawn, he concludes that such apparent improprieties are the result of unauthorized favoritism; of the looseness of station agents who dare to disobey the demurrage manager. We do not endorse the *Lumberman's* method of trying to evade payment of an unpalatable bill, for we think his scheme ought to be squelched rather than encouraged. Unpalatable doses often prove quite salutary. But it is gratifying to see this recognition of the important fact that demurrage at best has to be managed by rules which in many cases can only loosely fit the conditions to be dealt with. This is a sign of progress; and it affords ground for hope that before long the whole community of freight receivers will understand that in paying for the use of freight cars as storehouses, they are only settling a bill

which is a legitimate charge against the merchandise which is in the cars. Demurrage cannot always be assessed or collected when it ought to be; the bills which are assessed cannot always be so adjusted that their reasonableness will be susceptible of proof; and sometimes the carrier will apparently be indebted to the consignee, while at the same time the consignee will be unable to prove his claim, and collect money. The various uncertainties about demurrage can be made to afford material for controversy until the end of time. In the meanwhile there is no getting away from the certainty that a car is not a storehouse, and that its use as such warrants not only a storage bill but a penalty. The consignee constantly seeks to offset this penalty by penalizing the railroad company for delays in transportation. Without going into this branch of the question at this time, we may note one important feature in which the two conditions differ: the railroad has a constant incentive to move freight to its destination, because the cars containing it are wanted as soon as possible for other freight; this affords a presumption that it is using due diligence. If there is at any time a desire for delay it is abnormal. The consignee, on the other hand, often has a direct and palpable motive for delaying the unloading of cars, especially if he be one of those merchants without warehouses who like to accommodate buyers by keeping on hand, in the railroad yard, a large variety of their wares ready for immediate delivery.

Cleveland, Cincinnati, Chicago & St. Louis.

The report for the year ending June 30 furnishes an excellent example of the practice of the Vanderbilt lines of keeping down capital expenditure and paying for improvement work out of earnings. With 1,891 miles of main track and gross earnings of $20,390,761, the cost of ten engines, 336 freight cars and 19 passenger cars, amounting to a total of $498,429, was charged to maintenance of equipment, and the building of 59 miles of sidetrack, costing $310,236, was charged to maintenance of way. The joint charge for maintenance of way and of equipment was about $3,207 a mile, in addition to which $311,262 was appropriated from net income as part payment for new freight cars, other than those charged to operating expenses. A comparison of gross and net earnings, fixed charges and capital stock for the last ten years shows that as a result of this policy, while gross earnings have risen from $13,034,049, in 1894, to $20,390,762, the authorized capital stock has remained at $38,000,000 (of which only about $28,000,000 is outstanding), and fixed charges have increased only about $85,000. As a matter of fact, the interest charges in 1895 were several hundred dollars in excess of those for the current year.

Freight traffic not only showed a good increase in business done, but a considerably higher ton-mile rate, as in the case of the Chicago & North Western, which received comment last week. Tons of freight carried increased 557,394, although the average haul was lessened slightly. But the average receipt per ton hauled increased from about 99 cents to about $1.05, and the average ton-mile receipt was 6.44 mills, as against 5.92 mills in 1902.

In common with all the roads which have issued their reports up to the present time, increased wages and cost of supplies have brought up the cost of maintenance and operation. The increase over 1902, also an expensive year, is estimated at 14.3 per cent. for conducting transportation. The largest single item affected was fuel, the cost of which increased $273,767, or nearly 21 per cent. But, although there are still many applications for increased wages, and the prices of certain supplies are somewhat higher, President Ingalls believes that the summit of expenses has nearly been reached, and that they are not likely to be materially higher in 1904 than they have been in 1903. A striking feature of railroad operation throughout the country during the past few years has been the way in which great increases in costs have eaten up the profits of the extraordinary business handled. Mr. Ingalls' surmise that the summit of increased expense is in sight is, therefore, of especial interest, since gross earnings appear still to be maintaining large increases, with plenty of business ahead. In fact, the company reports the most business for July that it has ever had, and is unable, at the present time, to handle all the freight which is pressing upon it. The increased business seems to be general, and not confined to any one particular kind of traffic.

The freight statistics show the average number of loaded cars per train the same as last year—21.8. Mileage of empties showed some little increase, however. The average train load was 333 tons, as compared with 332 tons last year. A steady increase in train load was started in 1893, when the average load was 210 tons, and culminated in 1900, since which time it has fluctuated back and forth without showing permanent gains. The current figure, however, is nearly 100 tons greater than the Chicago & North Western average train load for the present year.

Passenger earnings increased from $5,487,506 to $5,778,490, part of the gain being attributable to increased passenger mileage, and part to increased rate. Passenger earnings this year exceeded $3,000 per mile of road for the first time, as a culmination of the increase in density of traffic which began in 1898. Freight earnings narrowly missed the $7,000 mark, so that the average earning capacity of the lines from these main sources is now slightly in excess of $10,000 a mile.

New capital expenditure during the year includes General Mortgage Bonds sold to provide for building about 25 miles of new track, of which a portion will be double, between Cincinnati and Indianapolis, in order to prepare for the St. Louis World's Fair business between Cincinnati and St. Louis. A contract has also been made with the St. Louis & San Francisco and the Chicago & Eastern Illinois, in accordance with which these railroads will share in the expense of double-tracking the line between Pana and East St. Louis, and building 50 miles of it new. By the new route, 12 miles of distance will be saved, besides the elimination of curvature. A new mortgage will be made upon this line, guaranteed by the C., C., C. & St. L., but the rental received from the Chicago & Eastern Illinois will more than provide for the interest on the bonds, so that there will be no additional charge against revenue. The delay and expense incident to the congestion at the Indianapolis yards has also been lessened for the future by purchase of an interest in the Chicago & Southeastern, which crosses four divisions of the Big Four, and makes for two of them a shorter line to the East than that by way of Indianapolis.

A few of the most important statistics of operation are given below:

	1903.	1902.
Mileage directly worked	1,891	1,891
Gross earnings	$20,390,762	$18,717,071
Conducting transportation	7,462,116	6,526,633
Maintenance of way	2,884,106	2,513,658
Maintenance of equipment	3,180,285	2,828,868
Net earnings	4,721,331	4,972,151
Net income	1,877,268	2,172,500

Trade Union Outrages in July.

The chronicle of trade union outrages during July, which is presented herewith, includes one murder, as did the similar chronicle for June. It will be noticed that the kind of assault apparently most in favor is for an overpowering number of union strikers to approach a non-union workman from the back, knock him down, and kick and tramp him into insensibility.

CHICAGO, Ill., July 1.—As detectives are escorting girls to their homes from the plant of the Kellogg Switchboard and Supply Company they are followed by a jeering crowd, who throw bricks and stones at them, injuring two of them.

July 2.—Julius Blandt, the cashier of the Kellogg Switchboard Company, is attacked by five men who cut his head, knock him down and strike and kick him until he becomes insensible.

Thomas Mullen, a moulder who declined to join the union and quit work at the Illinois Malleable Iron Works, is set upon by three men; a blow on the back of his head fractures his skull and he dies from its effects in a short time.

SALT LAKE, Utah, July 2.—Striking messenger boys of the Western Union Telegraph Company assault boys who take their places.

RICHMOND, Va., July 4.—An attempt is made by street car strikers to wreck a Seven Pines car by placing obstructions on the track.

DENVER, Colo., July 5.—Striking smelters cause riot in Globeville. The sixteen smelters who remained at work are assaulted and one of them badly beaten.

LYNN, Mass., July 7.—In a riot between members of the Boot and Shoe Workers' Union and the Knights of Labor, heads are split open, men are knocked down, kicked and trampled upon and pistols are drawn. The police after dispersing the mob find three men lying unconscious and three others badly hurt.

RICHMOND, Va., July 8.—A. P. Hines, a school teacher, who is employed by the electric line during the summer is set upon and unmercifully beaten.

BALTIMORE, Md., July 8.—Five striking bakers are arrested for disturbing the peace in endeavoring to keep non-union men from taking their places.

NEW BEDFORD, Mass., July 9.—Striking team drivers assault Claudio Rollins, a non-union driver, and at night break into the stable of Mortimer McCarthy, a boss teamster, who has refused to agree to the schedule and gash one of his horses.

NEWARK, N. J., July 10.—Strikers at the factory of the American Bit and Harness Company set upon newly hired employees; one man is hit in the face with a brick and in the back by a stone, and two others are beaten and kicked.

BUFFALO, N. Y., July 12.—Robert H. Steeley, a union steel striker, is arrested for assaulting Charles E. Styslin, a non-union steel worker.

RICHMOND, Va., July 13.—Stones are thrown at cars and a few shots fired from fields at Lakeside.

CLINTON, Mass., July 14.—Thirty-two striking stone masons armed with revolvers make a tour of the Wachusett dam district and by threatening to shoot the workmen unless they stop labor within two hours force 430 men to lay down their tools and tie up work at the dam. One man is thrown into the Nashua River because he is slow in obeying their summons.

CLEVELAND, Ohio, July 14.—Ten non-union structural iron workers employed by the Van Dorn Iron Works are assaulted by strikers and one of them beaten into unconsciousness.

JAMAICA PLAINS, Mass., July 15.—Three hundred striking Italians who had been employed by the Boston Elevated Railroad Company hurl bricks and cobblestones at four men who remain at work.

RICHMOND, Va., July 15.—A dozen men armed with stones and pistols are surprised in a dark alley in the act of waylaying and attacking a late car. They placed obstructions on the track, and at a signal advanced with a yell to attack the employees when they were met by militia and arrested.

PHILADELPHIA, Pa., July 16.—Six striking textile operatives spring out of a dark alley upon Ollie Ochs, who had returned to work, and beat him.

DETROIT, Mich., July 16.—Strikers at the Brennan Boiler Works throw sticks and stones at the non-union employees.

BROOKLYN, N. Y., July 16.—About fifty striking Italian macaroni makers throw stones at and partially demolish a truck containing men who were being driven to take their places.

SPRINGFIELD, Ill., July 16.—Frank McGrath, a striker of the Springfield Boiler and Manufacturing Company, is arrested for assaulting a non-union employee.

CHICAGO, Ill., July 16.—Rioters keep up an attack all day upon the Kellogg Switchboard factory and its employees, and throw bricks and stones at its wagons. A score or more persons are struck and a half dozen or more of them badly injured.

PERTH AMBOY, N. J., July 17.—Thirty striking employees at the Ostrander Fire Brick Works make an attack on the factory at midnight.

CHICAGO, Ill., July 17.—Three thousand rioters armed with stones, blocks and clubs storm and attempt to wreck the plant of the Kellogg Switchboard Company. Clashes between policemen and the mob are frequent throughout the day. Many persons are injured, eight of them badly.

PHOENIX, Ariz., July 18.—Strikers on the Poland Tunnel make frequent assaults on non-union workmen and a shot is fired at a watchman at the tunnel, with the evident intention of ending his life.

NEW YORK, July 19.—Charles B. Adams and Charles Johnson, employed in the Morgan Iron Works, are assaulted and beaten by half a dozen striking machinists.

PHILADELPHIA, Pa., July 19.—In a riot inaugurated by the attempt of seven striking textile workers to break up a game of quoits of men who had remained at work, one man is stabbed and two others cut and knocked down.

ST. LOUIS, Mo., July 22.—Union men attack Joseph Meyer and Michael Sheehan who refuse to quit work at the Machinery Building on the World's Fair Grounds, strike Sheehan in the face and give Meyer a fractured skull from which he may die.

RICHMOND, Va., July 23.—Cars in several parts of the city are attacked by explosives, stones and pistol shots from concealed assassins. A lady passenger is struck on the ankle and painfully injured.

KANSAS CITY, Mo., July 24.—Frank Delicate, a painter in the New York Flats, while eating his lunch is approached by three men who ask him if he belongs to the union. When he replies that he does not, they break his nose.

CHICAGO, Ill., July 24.—Striking woodworkers at the factory of Ehman & Company, who have made a number of attacks upon non-union workmen, assault Adolph Ehman, striking him in the back. He fires in the air and then wounds one of his antagonists.

NEW YORK, July 30.—About forty of the striking drivers of the New York Transfer Company surround the wagon driven by James Wendell, a non-union driver, assault Wendell, and by cutting the ropes spill the load of trunks in the street.

DETROIT, Mich., July 30.—Thirty-five firemen and helpers quit work at the United Railway Power House without notice and smash an automatic stoker worth $50,000 on their way out of the building.

CHICAGO, Ill., July 31.—Mrs. Motis swears that two of the Illinois Malleable Iron Company strikers called at her house and threatened to kill her husband if he left the house to go to work in the factory the next day.

RICHMOND, Va., July 31.—A Broad street car is blown up by dynamite while in service. None of the sixteen passengers are seriously injured. Nine other cars are attacked by being shot at, hit with stones and buckshot. Spikes and torpedoes are placed on the track. At least four persons are injured.

TRADE CATALOGUES.

Water Purification for Cities by Sulphate of Iron is the title of a 50-page catalogue issued by the American Steel & Wire Company. Sulphate of iron is one of the chemical products of this company. A description of the municipal purifying plant at Quincy, Ill., on the Mississippi River, is given, together with reports of tests using the sulphate of iron process. In this plant sulphate of iron is dissolved in a tank holding 3,600 gal. of water and two other tanks of 7,000 gal. capacity each contain a solution of lime. The river water is charged with the proper amount of sulphate of iron solution while being pumped from the intake well and the lime solution is added after the water passes through the pumps. The water then passes to the settling basin, where the foreign matter is removed by precipitation and coagulation. The water is then filtered. The filtration plant at Quincy was built from designs furnished by the New York Continental Jewell Filtration Company. About 1½ grains of sulphate of iron is used per gallon. The tests show good results.

The Ajax Manufacturing Company, Cleveland, Ohio, has sent us a 74-page 5½ in. x 8½ in. catalogue bound in cloth. The illustrations include bolt-heading machines, upsetting machines, forging machines, rivet machines,

pressed and forged nut machines, bulldozers, eccentric and forging rolls, etc. Illustrations of the various classes of work done by the several machines form an interesting feature of the book, and the arrangement of the cuts is artistic. The last 14 pages contain tables and notes on iron and steel.

The American Well Works, Aurora, Ill., has issued Form 89, giving selected pages from its latest catalogue. The products described include various types of well-sinking machinery, rotary pump jacks, cable rigs, well-auger outfits, horse powers and pumping machinery of all kinds, etc.

J. A. Fay & Egan Company, Cincinnati, has issued a pamphlet containing a list of second-hand machines in stock to date.

NEW PUBLICATIONS.

The Calculation of Concrete Beams (Berechnung von beiderseits armierten Betonbalk). A thesis by Fritz von Emperger. Vienna, Austria: Lehman & Wentzel. Mr. von Emperger gives a thorough analysis of the calculation of concrete beams reinforced with iron in both the tension and compression zones, producing a number of diagrams showing the strength of beams under various conditions. To give these practical value and interest the results of a number of tests by various observers are introduced. The experimental results give a satisfactory confirmation of the calculation. In a short appendix are given the results of some tests made to determine the cohesion between the iron and the concrete. In a series of tests of Mr. Sanders, rods of diameters of 0.39 in., 0.47 in., 0.55 in., 0.63 in., 0.71 in. and 0.79 in. were bedded in cubes of cement 4 in. square. The force required to push the bars out of the cement amounted to an average of 170 lbs. per sq. in. of contact surface.

The Right of the Non-Union Man to Work.

In President Roosevelt's Labor Day address he courageously states the principles that are especially applicable to the present labor situation—the right to work and a decent attitude:

"We can keep our Government on a sane and healthy basis, we can make and keep our social system what it should be, only on condition of judging each man, not as a member of a class, but on his worth as a man. It is an infamous thing in our American life, and fundamentally treacherous to our institutions, to apply to any man any test save that of his personal worth, or to draw between two sets of men any distinction of conduct, the distinction that marks off those who do well and wisely from those who do ill and foolishly. There are good citizens and bad citizens in every class, as in every locality, and the attitude of decent people toward great public and social questions should be determined, not by the accidental questions of employment or locality, but by those deep-set principles which represent the innermost souls of men. . . . .

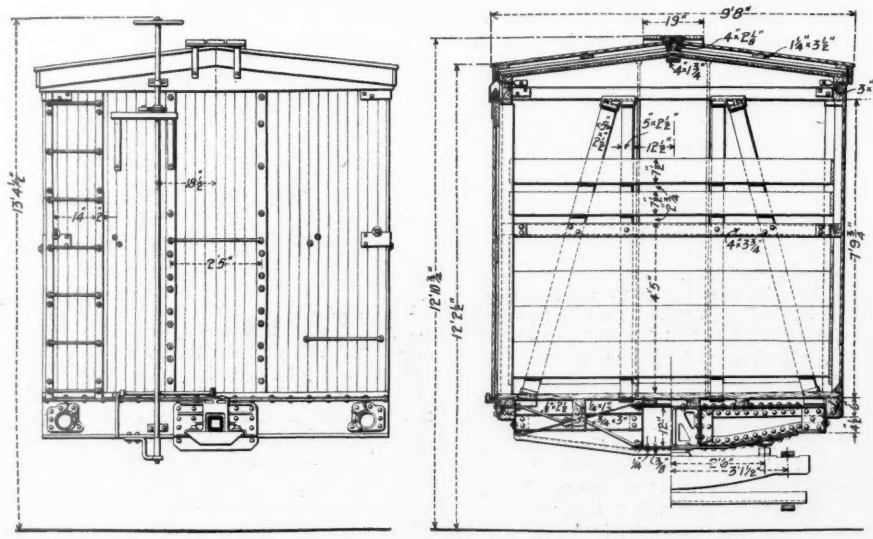
"The line of cleavage between good and bad citizenship lies, not between the man of wealth who acts squarely by his fellows and the man who seeks each day's wage by that day's work, wronging no one, and doing his duty by his neighbor; nor yet does this line of cleavage divide the unscrupulous wealthy man who exploits others in his own interest, from the demagogue, or from the sullen and envious being who wishes to attack all men of property, whether they do well or ill. On the contrary, the line of cleavage between good citizenship and bad citizenship separates the rich man who does well from the rich man who does ill, the poor man of good conduct from the poor man of bad conduct. This line of cleavage lies at right angles to any such arbitrary line of division as that separating one class from another, one locality from another, or men with a certain degree of property from those of a less degree of property. . . . . .

"We must act upon the motto of all for each and each for all. There must be ever present in our minds the fundamental truth that in a republic such as ours the only safety is to stand neither for nor against any man because he is rich or because he is poor, because he is entitled to no more and should receive no less. Finally we must keep ever in mind that a republic such as ours can exist only in virtue of the orderly liberty which comes through the equal domination of the law over all men alike, and through its administration in such resolute and fearless fashion as shall teach all that no man is above it and no man below it."

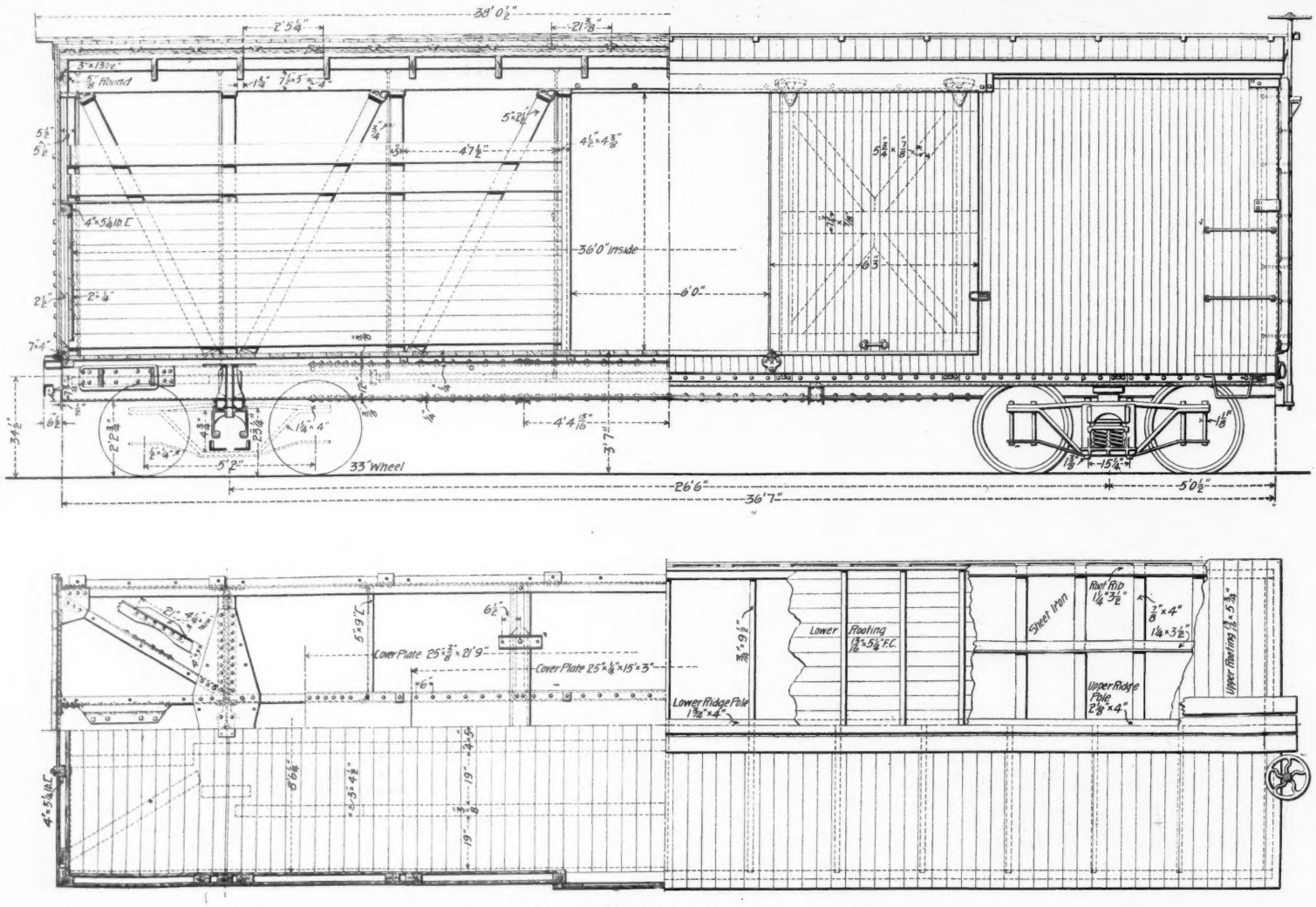
Box Cars for the Central of New Jersey.

The Central Railroad of New Jersey has recently put into service the first of an order of 1,000 box cars with steel underframes and 60,000 lbs. capacity. They were built by the American Car & Foundry Co. at Berwick, Pa. The general dimensions and details are shown in the accompanying engravings. The cars are 36 ft. long inside, 8 ft. 6¼ in. wide inside and 7 ft. 9¾ in. from sill to plate. The clearance height from rail to top of brake staff is 13 ft. 4½ in. The light weight is 37,500 lbs., somewhat higher than in most designs of 60,000 lb. cars even with steel underframes, but this is due to the very substantial construction throughout. No attempt has been made to sacrifice strength for weight.

The underframe is of structural steel shapes, the longitudinal and end sills being channels, and the bolster, a built up structure of plates and angles. The center sills are 12 in. deep, spaced 18 in. apart. They are tied together by double top and bottom cover plates, forming a box column of great longitudinal and vertical stiffness. These cover plates are ⅜ in. and ¼ in. thick, the ⅜ in. plate being 21 ft. 9 in. long and laid next to the channels. The ¼ in. plate is laid on the ⅜ in. plate and secured to the sills by the same riveting. It is 15 ft. 3 in. long. The end sill is a 12 in. channel with the flanges



End Elevation and Cross-Section of 30-Ton Box Car—C. R. R. of N. J.



Plan and Elevation of 30-Ton Box Car—C. R. R. of N. J.

out, set 4 in. above the level of the longitudinal sills, to which it is secured by gusset plates and angles. The cross-bracing between sills in the center of the car is shown on the cross-section. Between the bolster and the cross-tie proper there is a 5 in., 9 lb. channel with the web vertical, which is fastened to the side and center sills with angle plates. The cross tie is a built-up structure which is intended principally to support the wooden intermediate sill or nailing strip. The sill, which is 8 in. x 3 in., rests in a shoe supported at the intersection of an X shaped brace made of three pieces of flat bar. A 5 in., 9 lb. channel is bent to suit the difference in depth between the center sills and the side sills and extends clear across the car, being riveted to all four sills.

The bolster is built up around the center sills. It consists of a vertical web plate of suitable depth to fit inside the flanges of the sills, broad top and bottom plates secured to the web by angles in the corners and a filling block in between the center sills. End sill diagonal braces of 4 in. angles extend outwardly to the corners of the frame.

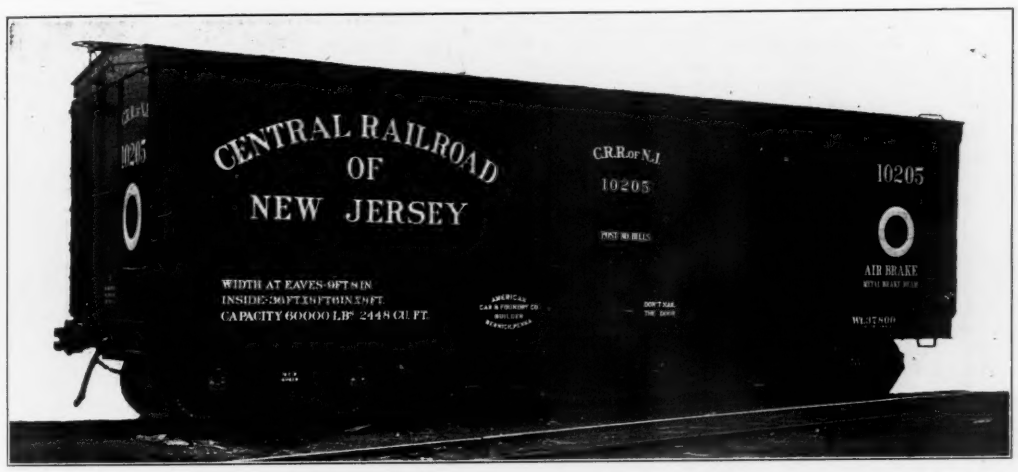
The body of the car is supported on a system of false wooden sills which are bolted to the metal sills. These members are more than mere nailing strips, the side sills for instance being 6 in. x 5 in. timbers, continuous from end sill to end sill. To them the malleable iron post pockets for the body framing are secured instead of to the metal frame. The wooden side sills rest on a 3 in. x 3 in. x ¼ in. angle riveted to the outside of the metal side sill. The intermediate sills, 8 in. x 3 in., rest on the cross ties and extend only between the bolsters. On top of the center sill cover plate there are two pieces 2½ x 4 in. running the entire length of the car. Wooden nailing strips are also laid on top of the end sill diagonal braces.

floor line. A 1¾ in. x 1¾ in. angle is riveted to the top flange of the channel clear across the car and the end sheathing is placed between this and the posts. The inside lining is fastened to the posts with ⅝ in. bolts bearing on the inside on a 2 in. x ¼ in. strap washer. These posts are 4¼ in. x 4 in. and extend through the outside sheathing. They are faced on the inside with a 4 in., 5.25 lb. channel from sill to end plate. The end girth is also sheathed with a similar channel. Such a construction ought to withstand the effects of the most severe shifting loads.

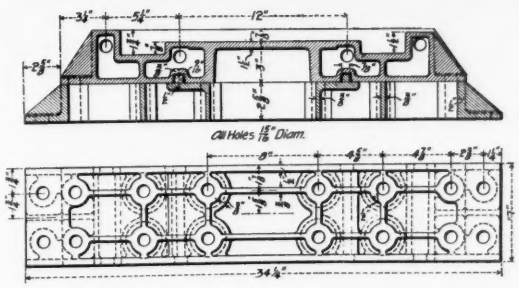
The draft gear on these cars is the Williamson-Pries tandem spring gear, which is standard on the Central of New Jersey. The engravings show the application of the gear to wooden sills and the modified form of draft lug used on these cars with steel underframing.

The special equipment includes Symington journal boxes, American Steel Foundries' cast steel truck bolsters and column bolt castings, Barber oscillating device, Tower 5 in. x 5 in. steel couplers, Williamson-Pries draft gear, Dunham door fixtures and Excelsior improved inside metal roof laid over an extra course of boards on top of the carlines.

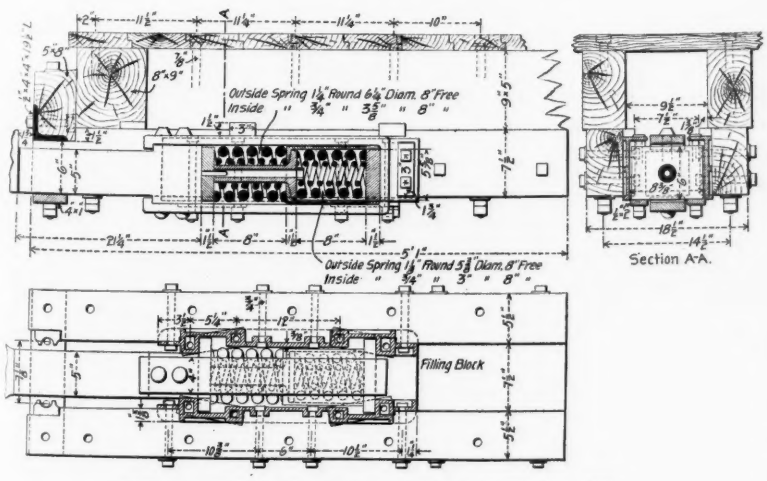
We are indebted to Mr. George W. Wildin, Mechanical Engineer, for the drawings and photograph from which the engravings were made.



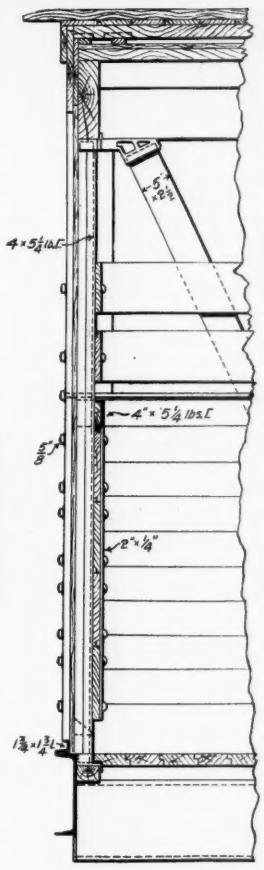
30-Ton Box Car—Central Railroad of New Jersey.



Draft Lug for Steel Sills.


Outside Spring 1¼" Round 6¼" Diam. 8" Free
Inside " ¾" " 3⅝" " 8" "
Outside Spring 1¼" Round 5⅛" Diam. 8" Free
Inside " ¾" " 3" " 8"
Filling Block
Section A-A.

Williamson-Pries Draft Gear Applied to Wooden Sills.



Detail of End Framing.

The end construction of these cars is exceptionally strong. The detail drawing shows this clearly. The wooden end sill, which is inside the channel or end sill proper, is cut down to a depth of 2½ in. where the post pocket rests on it. This gives a 1½ in. shoulder against the channel, for the post in addition to the bearing afforded by the lip of the post pocket on the wooden sill below the

The American Street Railway Association Convention.

The twenty-second annual meeting of the American Street Railway Association was held at Saratoga Springs, N. Y., September 2, 3 and 4. The meeting was a successful one in every way, in point of numbers present, the interest shown in the discussions and the large number of exhibits. Additional attractions were the simultaneous meetings of the Street Railway Accountants' Association and the American Railway Mechanical and Electrical Association, a new offspring of the Street Railway Association.

In the absence of the President, Mr. J. C. Hutchins, Detroit United Railway, Vice-President W. Caryl Ely, of Buffalo, called the meeting to order and then read his opening address, in which he made a strong plea for the adoption of a uniform system of accounting and reports. He also reviewed the growth of the suburban and interurban lines during the last year and pointed out the necessity of taking every precaution to insure safety to passengers, installing some reliable and efficient system of signals, putting in substantial roadbed and permanent structures, equipping high speed cars with efficient brakes and the construction of substantial and fireproof rolling stock. Following the reading of the secretary's report, which showed a substantial balance of funds on hand and a membership of 206 companies, the question of compensation for carrying U. S. mail by street railway companies in large cities was brought up. It was the unanimous opinion that the present scale of charges is much too low, and the representatives of a few of the companies stated that unless the Association took the matter up immediately the companies would take steps individually to increase the rates. After some discussion a resolution was adopted empowering the President to appoint a committee of three to confer with the Postmaster General and endeavor to arrange a fair and adequate rate for the carrying of mail in pouches and the running of mail cars.

The papers read and discussed were as follows:

The Right of Way, by Herbert H. Vreeland, of New York.

Comparative Merits of Single and Double Truck Cars for City Service, by John I. Beggs, of Milwaukee.

The Manufacture and Distribution of Alternating Currents for City Systems, by Richard McCulloch, of Chicago.

Freight and Express on Electric Railways, by J. B. McClary, of Birmingham.

Train Orders and Train Signals on Interurban Roads, by T. E. Mitten, of Buffalo.

The Evils of Maintenance and Champerty in Personal Injury Cases, by Michael Brennan, of Detroit.

Electrically Welded Joints, by William Pestell, formerly of Worcester, and now of J. G. White & Co.

Steam Turbines, by W. L. R. Emmett, of the General Electric Company, Schenectady.

The first day's session was devoted to routine business and discussion. On the second day only one paper was read and discussed.

RECENT STEAM TURBINE DEVELOPMENTS.

This is the title of a paper read by W. L. R. Emmett, of the General Electric Co., in which he reviewed the progress of the steam turbine as a prime mover and dwelt particularly on the history of the development of the Curtis turbine. The principal features of the 5,000 K. W. machines recently installed in the new station of the Commonwealth Electric Co. of Chicago were described in detail and reference made to tests now in progress to determine their efficiency. At the present time the General Electric Co. has under contract, 200,000 K. W. in turbine generating units. In the discussion which followed, the relative merits of reciprocating steam engines, steam turbines and gas engines were brought out and the cost of operation of each shown to be entirely a matter of local conditions, depending largely on the cost of fuel. A resolution was carried, directing the Executive Committee to have presented at the next meeting papers setting forth the merits of each power generating system.

The third day was devoted entirely to the reading and discussion of papers.

ELECTRIC WELDED JOINTS.

This paper, by William Pestell, formerly Superintendent of Motive Power, Worcester Consolidated Street Railway Co., Worcester, Mass., dealt with the system of welding rail joints by electricity, devised by Prof. Elihu Thompson and used by the Johnson Co. The present form of apparatus was described in detail and figures given of the cost of the work and the durability of the joints. Since 1897, 208 miles of track have been welded with this process.

THE MANUFACTURE AND DISTRIBUTION OF ALTERNATING CURRENTS FOR LARGE CITIES.

Extracts from this paper by Richard McCulloch will appear in a subsequent issue. There was no discussion.

THE EVILS OF MAINTENANCE AND CHAMPERTY IN PERSONAL INJURY CASES.

This paper was prepared by Michael Brennan, attorney for the Detroit United Railway, and is a severe denunciation of the practices of the "ambulance chaser." The growth of railroads in this country and the multiplication of factories and industrial establishments have necessarily increased the number of accidents accruing to employees and others. This condition of things has given rise to the existence of a class of lawyers in all large centers of population, who make a specialty of pressing cases of personal injury, and whose fees are contingent upon ultimate success, whether by compromise or at the end of a suit. In the city of New York there are on the present calendar 29,697 cases for trial, and of this number 5,766 are against the surface street railway corporations. Probably half the jury cases heard in the State of New York alone in any one year are actions for personal injuries resulting from alleged negligence.

The prosecution of personal injury cases has become a systematized business. Many firms employ runners, who maintain close business relations with surgeons, police-

men, saloon-keepers and others, whose business brings them in touch with an accident shortly after its occurrence, so that these runners, who are furnished with blank contracts by their patrons, reach the hospital almost as soon as the ambulance, and secure a contract from the injured person, giving to the law firm 50 per cent. of the damages to be recovered before the surgeon's knife has left its case. The author believes that such a condition of affairs can only be remedied by going back to the old measures taken in Roman law, long ago abrogated in our courts, whereby maintenance and champerty are declared illegal and punishable by fine or imprisonment.

TRAIN ORDERS AND TRAIN SIGNALS ON INTERURBAN ROADS.

Extracts from this paper by C. A. Coons, Superintendent of Transportation, International Railway Co., Buffalo, N. Y., will be printed in a subsequent issue.

FREIGHT AND EXPRESS ON ELECTRIC RAILWAYS.

Extracts from this paper by J. B. McClary, of Birmingham, Ala., were printed in the *Railroad Gazette* September 4 (p. 632). The discussion which followed was in the nature of an experience meeting, the representatives of a number of roads citing their experience in handling on a larger or smaller scale, package freight. The Utica & Mohawk Valley operates a delivery and collection service in connection with its express service, and while the expense is high, 70 per cent. of the gross receipts, the company finds that indirectly its service pays well. Another road contracts for the collection service, receiving a percentage of the receipts. Attention was directed to the fallacy of attempting to do a small freight business in the regulation steam road manner which involves the running of freight cars, the collection and storage of freight in freight houses with all its attending expense. The profit in freight is on long haul, and until the electric roads can establish connections with the existing steam roads or carry long haul freight on their own lines, the hauling of freight cannot become a highly profitable branch of the business.

THE RIGHT OF WAY.

H. H. Vreeland's paper of this title appeared in part in the *Railroad Gazette*, September 4 (p. 633). Mr. Vreeland on the opening of the discussion expanded his brief remarks in the paper and emphasized the necessity of concerted action on the part of all street railways in obtaining reasonable regulation of traffic on city streets to the end of furnishing the public with safe and rapid transportation. His remarks were followed by similar statements from other members. The regulation of traffic is founded on the rights and interests of the many as against the few, and the enactment and enforcement of just laws or ordinances will do much to relieve congestion and prevent the constant hue and cry against the railroad companies which are doing the best they can to furnish frequent and fast service.

COMPARATIVE MERITS OF SINGLE AND DOUBLE TRUCK CARS FOR CITY SERVICE.

John I. Beggs, of Milwaukee, opened this subject as a topical discussion. The double truck car has a marked advantage over the single truck car in easy riding over rough track. The cost of maintenance is less, larger and more comfortable cars can be used, and with four motors under the car, the acceleration is materially increased.

The report of the Committee on Rules for Employees was adopted as revised. A resolution was offered and referred to the Executive Committee to change the name of the Association to "The American Electric Railway Association." A committee report was adopted governing the furnishing of reports and discussions to the technical press. Hereafter on request of any speaker his remarks may be withheld from the printed reports or revised before publication. A censorship by committee will be established and all matter for publication must pass through its hands. The daily publication of the proceedings is requested to be discontinued.

The officers for the ensuing year are:

President, W. Caryl Ely, President, International Railway Co., Buffalo, N. Y.

First Vice-President, Elwin C. Foster, President, New Orleans Railways Co., New Orleans, La.

Second Vice-President, John Grant, General Superintendent, St. Louis Transit Co., St. Louis, Mo.

Third Vice-President, James F. Shaw, President, Boston & Worcester Street Railway Co., Boston, Mass.

Secretary and Treasurer, T. C. Penington, Treasurer, Chicago City Railway Co., Chicago, Ill.

Executive Committee: President, Vice-Presidents, and Jere C. Hutchins, President, Detroit United Railway, Detroit, Mich.; A. B. Colvin, President, Hudson Valley Railway Co., Glens Falls, N. Y.; G. Tracy Rogers, President, Binghamton Railway Co., Binghamton, N. Y.; W. A. Smith, General Manager, Omaha & Council Bluffs Railway Co., Omaha, Neb.; S. L. Nelson, Vice-President and General Manager, Fort Wayne & Southwestern Traction Co., Fort Wayne, Ind.

A partial list of the exhibits at the convention follows:

Adams & Westlake Co., Chicago.—Display of conductors' and signal lamps, tail lamps, Wagenhal electric (arc) head lights, incandescent lamp head lights and ratchet brake handles.

American Brake Shoe & Foundry Co., New York.—Samples of flanged and plain-faced brake-shoes of all the standard types made by the company (Sargent, Diamond S, Streetor, Corning, Lappin, etc.); marginal protecting strip for protecting asphalt and other pavement from wear next to the rail. Also a new type of composition filled brake-shoe, in which the filler of iron filings cemented with asphalt is bonded with expanded steel inserts.

American Car & Foundry Co., New York.—Solid rolled steel wheel, Fowler patent, and model of Fowler truck side bearing.

Atlas Railway Supply Co., Chicago.—Atlas rail joint for ball and T-rail; Atlas step-down joint for joining rails of different sections; tie-plates and step-chairs.

American Car Seat Co., Brooklyn, N. Y.—"Pushover" car seats upholstered in canvas-backed rattan and plush for electric and interurban cars.

Baldwin Locomotive Works, Philadelphia, Pa.—Truck built for the Interborough, New York, equipped with Westinghouse 50c motors.

Baltimore Railway Specialty Co., Baltimore, Md.—Norwood ball-bearing center plates and side bearings and combination center plate and side bearing in one piece.

Berry Bros., Ltd., Detroit, Mich.—Large panels finished in different colors with varnish made by the company.

J. G. Brill Co., Philadelphia, Pa.—An exhibit of large sized brass models of Brill trucks, Eureka maximum traction, No. 27, No. 27G and No. 21E and samples of solid forged truck side frames.

Bullock Electric Mfg. Co.—A 400 k.w., 25 cycle, 3 phase rotary converter, part of the equipment of two 1,000 k.w. generators and six rotaries for the Scioto Valley Ry.

The Celluloid Co., New York.—A number of car seats and parlor car chairs upholstered in "Texoderm."

L. C. Chase & Co., Boston.—Samples of plush upholstery materials, Chase leather and curtain material for window curtains, Chase curtain fixtures.

Chicago Pneumatic Tool Co., Chicago.—A complete line of pneumatic tools, including rivetting, chipping and caulking hammers, air drills and boring machines, supplied with air from a small motor-driven air compressor.

Climax Stock Guard Co., Chicago.—Climax stock guard.

Consolidated Car Heating Co., Albany, N. Y.—Electric heaters for street and interurban cars, an exhibit of the type of heaters ordered for the Interborough subway cars, truss plank heaters for cross seat cars, a large panel on which were mounted all the standard apparatus, heaters, switches and cut-outs, made by the company and a new type of cross-seat heater, in which both wires are brought out at one end.

Continuous Rail Joint Company of America, Newark, N. J.—Continuous rail joint for ball and T-rail sections.

Curtain Supply Co., Chicago.—Samples of Burrowes, Forsyth and Acme curtain fixtures and numerous curtain fabrics arranged in an attractively decorated booth.

Duff Mfg. Co., Allegheny, Pa.—Barrett ratchet jacks of all sizes and types for different purposes; armature jack mounted on hand truck for shop use.

The O. M. Edwards Co., Syracuse, N. Y.—Exhibit of Edwards' vestibule platform trap door and Edwards' window fixtures.

Federal Mfg. Co., Cleveland, Ohio.—Keeler curtain fixtures.

General Electric Co., Schenectady, N. Y.—This company had an attractive reception booth in the courtyard, but no exhibit of machinery or appliances since the convention members were taken through its works at Schenectady on a special excursion and shown all of the products of the company in actual operation.

Gold Car Heating & Lighting Co., New York.—Electric heaters of the panel and coil types for elevated and surface cars.

Gould Storage Battery Co., New York.—Samples of storage battery plates and a number of photographs of storage battery installations for isolated plants and railroad and lighting work furnished by the company.

Heywood Bros. & Wakefield Co., Wakefield, Mass.—Exhibit of Wheeler car seats for interurban and street cars, upholstered in plush and rattan and with wooden slat back.

H. W. Johns-Manville Co., New York.—A large number of samples of "Noark" enclosed fuses, overhead line material, trolley wheels, section insulators and electric heaters, a number of designs of which have recently been brought out.

Kinnear Mfg. Co., Columbus, Ohio.—A large rolling steel door showing the application of this device to car-barns or freight houses.

Walter McLeod & Co., Cincinnati, Onio.—Buckeye oil heater and Buckeye light, pneumatic painting machines, oil furnace, sand blast machine.

Merritt & Co., Philadelphia.—An exhibit of expanded metal lockers.

Pantasote Co., New York.—Reception booth in the lobby of the Grand Union Hotel, representing a section of a car with seats upholstered with and curtains made of Pantasote.

Peckham Mfg. Co., Kingston, N. Y.—A large booth in which were shown three types of high speed "M. C. B." electric trucks and the 14B3X, short wheel base truck, all equipped with the Taylor non-chattering brake hanger.

Pennsylvania Steel Co., Steelton, Pa.—Sections of T-rails for street railroads; frogs, switch stands and switch points, crossings, etc.

Railway Appliances Co., Chicago.—Q. & C.-Stanwood car step, car and engine replacers, rail saw and rail drill in operation, model of Whall's metallic window casing, Ajax diaphragm and pneumatic tools.

Railway Steel-Spring Co., New York.—Steel tired wheels, helical and elliptical springs, trolley springs.

Robins Conveying Belt Co., New York.—A working model of a belt conveyor and a Richardson automatic weighing machine.

The Sherwin-Williams Co., Cleveland, O.—Samples of work finished with Sherwin-Williams paint and Ajax insulating varnish.

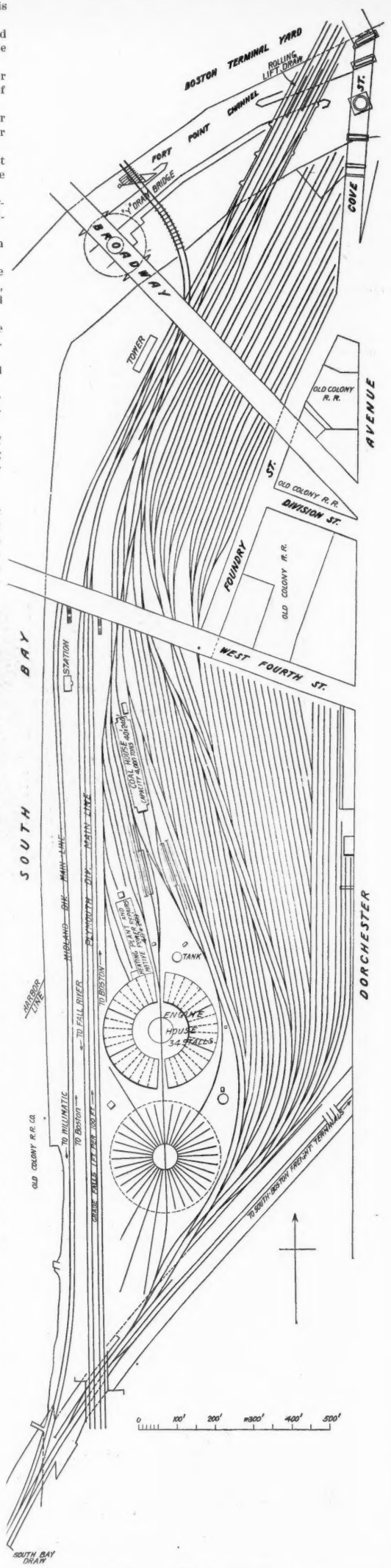
Standard Paint Co., New York.—Samples of Ruberoid roofing and P. & B. insulating tape, paper and electrical compounds, S. P. C. armature and field coil varnish.

Stanley Electric Mfg. Co., Pittsfield, Mass.—S. K. C. railway motor No. 401, shown with cover open and two S. K. C. No. 402 motors mounted on a truck and operated in connection with an S. K. C. controller.

Weber Railway Joint Mfg. Co., New York.—Weber rail joint as applied to a number of different ball and T-rail sections.

Westinghouse Companies, Pittsburg, Pa.—An exhibit on the piazza, including a complete outfit of air-brakes and slack adjuster as furnished by the Westinghouse Traction Brake Co., together with sectional pieces of the apparatus. Two types of series-multiple controllers were shown and the supplementary controller box for operating the magnetic track shoe-brake. A booth on the lawn, in which was shown complete the new multiple unit system of electro-pneumatic control. The entire apparatus for one car, including two No. 50c motors mounted on a Baldwin truck and the automatic motor driven air compressor for the air-brake system, was in operation. A single phase railroad motor was also shown.

Wheel Truing Brake Shoe Co., Detroit.—Samples of the wheel truing brake-shoe.



Plan of New Passenger Car Yard at South Boston—New York, New Haven & Hartford.

New Passenger Car Yard at South Boston.

The New York, New Haven & Hartford Railroad Company is peculiarly fortunate in owning a large tract of land, about 40 acres, adjoining the South Boston terminal station, and separated from it only by a water way, the Fort Point Channel, and here is now nearing completion a large and well-designed passenger car yard. The channel bridge carries six tracks. Two are main tracks and four are used for moving empty cars to and from the station. All the passenger cars coming to Boston are stored here excepting about 125 of the Providence division and these will also be brought here as soon as the stub tracks are completed to the water's edge. Work on the new yard was begun two years ago and the Chief Engineer, Mr. C. M. Ingersoll, Jr., has designed it to so supplement the main station yard that both for storage and for making up trains all future demands will be fully met so far as can be foretold. The train shed of the South Station, which serves the Boston & Albany as well as the New York, New Haven & Hartford, has a capacity exclusive of the subway tracks, of about 340 cars, and the terminal is designed to handle about 750 in and out trains a day—this for the two roads. The capacity of the new yard is approximately 750 cars and in it about 600 trains can be made up in a day. It consists of three separate divisions which are operated as separate yards.

No. 1 yard is used for storing through cars for the New York and Cape Cod runs and also all Pullman, dining and special cars. It has one ladder track leading direct from the Terminal yard and is served by two switch engines. It has twenty-four stub tracks with capacity ranging from two to sixteen cars. Of these tracks, No. 1 is used for storing wheels, No. 2 is the repair track, and No. 3, which has a direct outlet to the main line, is kept for the wrecking train. The other 21 tracks are used for storage as needed. The storehouse is next to track No. 4, and on this stub the dining cars are kept together so as to be conveniently supplied with ice and food. The repair shop is near track No. 2, where minor repairs are made. A drop table is being built for changing wheels. There are wooden platforms between each two tracks in this yard and horses are supplied for cleaning and airing carpets, mattresses and blankets. There are several hydrants adjacent to each track for washing the cars.

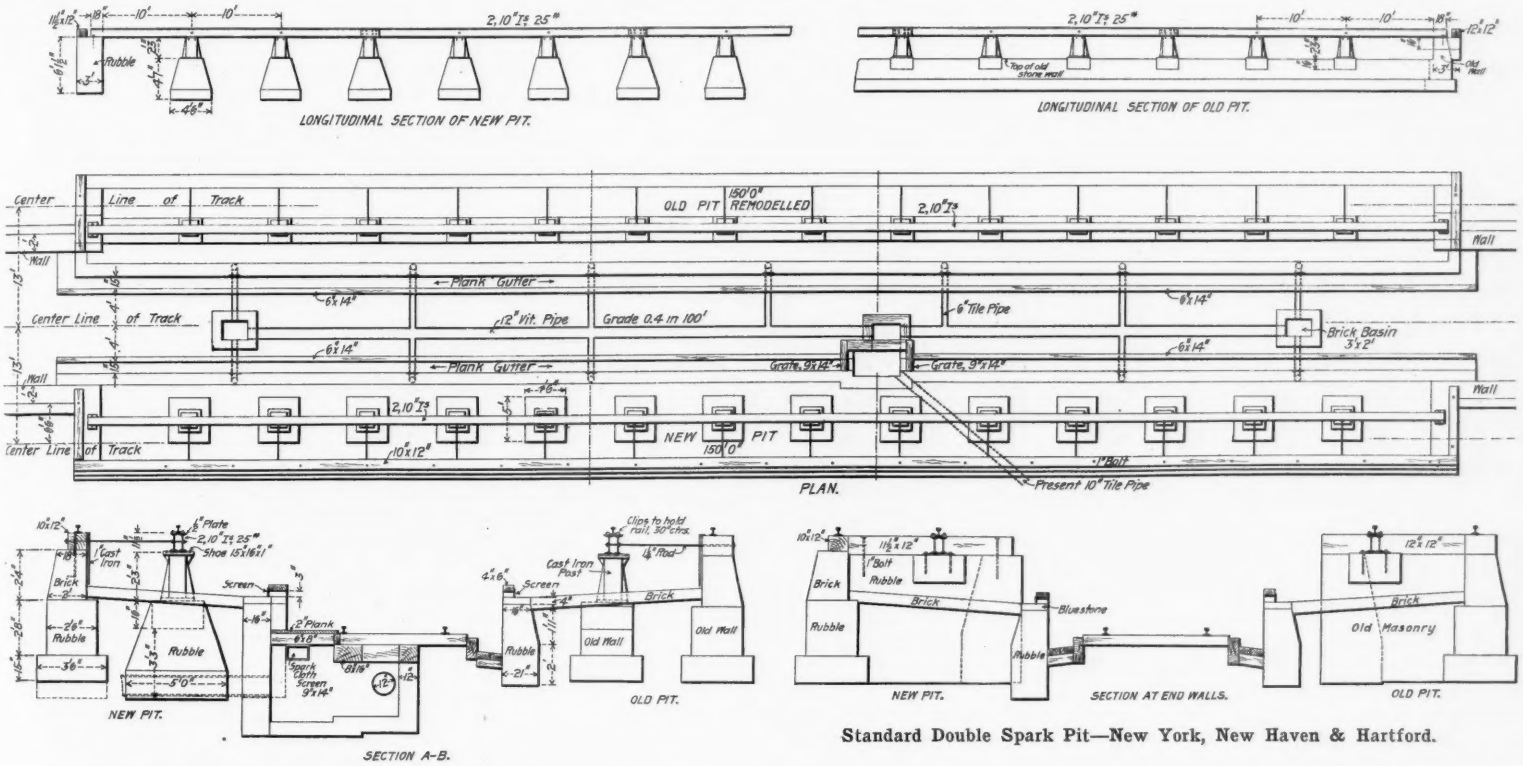
Yard No. 2 is somewhat unusual in that it has two outlets, one towards the terminal yard and one to the main line in the opposite direction. It has thirteen stub tracks with capacities ranging from four to fourteen cars, and two ladder tracks, one for each outlet. All the combination train cars are stored here and a few of the local cars. These combination trains are so called because they are made up of two or more trains, to be successively cut off at junctions with different branches of the road. One shifter is used for the entire switching of this yard.

No. 3 yard has sixteen stub tracks which will, when completed, hold from three to eighteen cars each. These stubs have not been run back their full distance as yet. This work is deferred until the completion of the city's bridge over Broadway. This yard is used exclusively for local cars. It has one ladder track and is operated by one shifter.

The engine house is designed to shelter thirty-six engines, mostly the large engines used for heavy through trains. Next to the engine house is a large turn-table which is operated by a Fairbanks, Morse & Co. gasoline engine. About thirty tracks radiate from this table and there is space for storing about eighty engines out of doors.

The two spark pits in this yard are both single, but the drawings herewith show the company's standard double spark pit. The pits are used both for sparking and dropping ashes and the central track is depressed to the most convenient depth for shoveling the ashes from the pit into the cars.

Pipes carrying water and air traverse the yard in all directions. Beside the hydrants before mentioned there are three stand pipes for engines. Air pipes are run close to all tracks so that the cars can be charged and the brakes tested at any point.



Standard Double Spark Pit—New York, New Haven & Hartford.

The Visintini System of Concrete Girders.

Herr Franz Visintini, an architect of Zurich, Switzerland, has invented a system of iron-concrete construction in which he gives the beams and pillars a lattice form, thus reducing the amount of material required, and gaining in strength and lightness. Fig. 1 shows the construction of beams by this method. The struts, which only take up compression stresses, are made of cement without a metallic core, except the upper flange of the beam. In this a light core is laid to facilitate construction and to hold the tie cores in place.

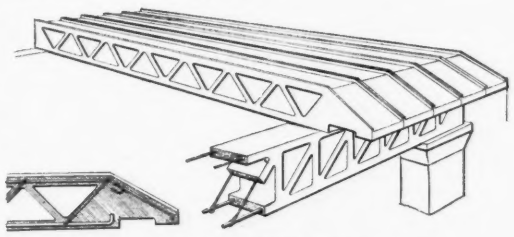


Fig. 1.—Visintini Beams.

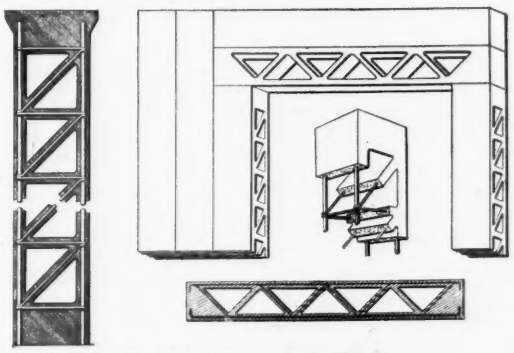


Fig. 2.—Columns and Girders.

Figs. 2 and 3 show applications of the system to various purposes. In addition to the gain in lightness and strength, the Visintini beams have the advantage that they can be formed before being put into place, so that there is no delay to the building while waiting for them to dry; and there is no encumbering scaffolding.

TECHNICAL.

Manufacturing and Business.

The Walter A. Zelnicker Supply Co., St. Louis, has for sale a new 15-ton steel wrecking car, with crane.

The Peckham Manufacturing Co. has orders for electric traction trucks from Porto Rico, Brazil and Chili.

Haywood Brothers & Dobbin, Jennings, La., will rebuild their iron works, which was recently destroyed by fire at a loss of $60,000.

The steam heating system of the Consolidated Car Heating Co., Albany, N. Y., has been adopted as standard by the lines comprising the Harriman system.

The W. A. Jones Foundry & Machine Co., Chicago, has been incorporated by R. J. Fellingham and others, with a capital of $100,000, to do foundry and machine work.

The Allentown Foundry & Machine Works, Allentown, Pa., will build a new machine shop and an addition to its foundry; a large amount of machinery for machine shop work will be bought.

The Taylor Signal Company, of Buffalo, has established an Eastern agency. The office is in the Broad-Exchange Building, New York City, and the agent is Mr. W. G. Hovey, heretofore Superintendent of the company.

The main office and factory of the Pilliod Company, makers of locomotive throttles, air-pump and injector packing, have been moved from Angola, Ind., to Swanton. The company is busy with several orders recently received.

L. F. Mahler, formerly District Manager at Chicago for the De Laval Steam Turbine Co., has been appointed District Manager at St. Louis, Mo., for the Bullock Electric Manufacturing Co., with offices at 1505 Chemical Building.

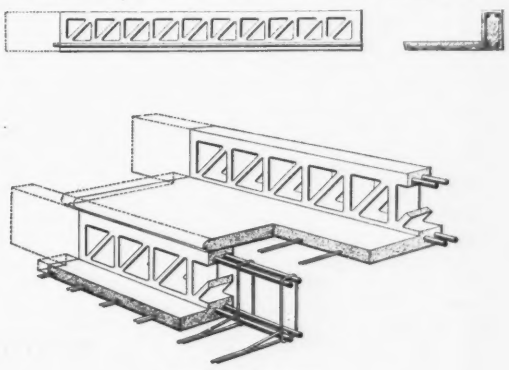


Fig. 3.—Staircase.

The Ingersoll-Sergeant Drill Co. will double its present facilities for manufacturing in the Pneumatic Tool Department. This enlargement is necessary on account of the increasing demand for the Haeseler "Axial Valve" pneumatic hammers.

Work has been commenced on the power house at Twenty-seventh street and Pennsylvania avenue, Philadelphia, for the Baldwin Locomotive Works. The building will be of steel and brick, one story high, 40 ft. wide

by 63 ft. 6 in. long, to cost about $16,000. Jacob Meyers & Co. have the contract.

The Wyckoff Pipe & Creosoting Co. of Stamford, Conn., with works at Portsmouth, Va., has received an order from Westinghouse, Church, Kerr & Co. for creosoted conduits for underground wires for the third rail electric railroad which Westinghouse, Church, Kerr & Co. are building in Pennsylvania.

Articles of incorporation of the Tabor Construction Company have been filed in Iowa, with a capital of $50,000 and with headquarters at Tabor, Iowa. The immediate object of the company is to build the electric railroad projected by the Council Bluffs, Tabor & Southwestern Electric Railway Co. from Council Bluffs through Tabor and through several counties in Missouri to some terminal yet to be determined.

The coal handling machinery at the Lincoln Wharf Power Station of the Boston Elevated Railroad, put in by the C. W. Hunt Company, recently unloaded a cargo of coal, raising it 90 ft. above tide water, at the rate of 320 tons an hour. In this plant the moving gear and coal cracker are electrically driven, and the hoisting engine is direct connected. The overhang of the folding boom is 40 ft. and the capacity of the shovel two tons. This performance is believed to be the best on record.

Iron and Steel.

The Schoen Pressed Steel Wheel Co. will soon have its new plant at McKee's Rocks, Pa., in operation.

The Rosedale Foundry Co., Allegheny, Pa., will be in full operation as soon as additional machinery has been installed.

The Southern Car Wheel Iron Co., Tallapoosa, Ga., has been incorporated by S. N. Noble and W. M. Kelley, with a capital of $100,000.

The American Rolled Gear Car & Wheel Co. has been recently incorporated, and will make rolled or pressed gear wheels near Pittsburg.

The United Steel Company's new open-hearth plant at Canton, Ohio, which contains three 45-ton furnaces, has been completed and will soon be in operation.

The Shenango Iron & Steel Co., Wheatland, Pa., is to install 10 and 18-in. mills, also a jobbing plate mill, for which contracts have not been let; the total cost of improvements and additions will be about $100,000.

The Clairton Steel plant at Clairton, Pa., will be closed for four weeks for annual repairs and the taking of stock. The plant employs about 1,000 men, who will now be idle for the first time since the works began operations.

According to reports from Montreal, an agreement has been reached between the directors of the Dominion Iron & Steel Co. and the Dominion Coal Co. for the cancellation of the lease held by the former of the coal company's property, which has been in effect since March 1, 1902.

The Iron and Steel Trade Situation.

Unprofitably low prices have had the effect of curtailing production. Buyers who delayed placing contracts in anticipation of more attractive quotations are now finding that the mills and furnaces are not going to allow the accumulation to exist. Labor and other costs of production, except fuel, are much higher, while consumers are slow to buy even at the extensive decline that has occurred during the current year. The leading works now idle are at Clairton, Sharon and Duquesne. Rails and other track supplies are in good demand, especially for prompt shipment, and more orders are placed for structural material for bridges and buildings. Sheet mills and some other divisions of the industry are in an uncertain position, owing to the labor situation.—*Dun's Review.*

Nickel Steel Tires.

The Pennsylvania Railroad has placed an order with the Standard Steel Works for nickel steel locomotive wheel tires. These will be made at once and will soon be in service.

International Association for Testing Materials

The next Congress of the International Association of Testing Materials will be held in St. Petersburg, Aug. 18 to 24, 1904. All papers and communications to be presented in print to the Congress must be sent in to the President, Prof. L. V. Tetmajer, Vienna, before Jan. 15, 1904, and all such papers are requested to be sent in triplicate to facilitate translation.

Signaling Contracts.

The Pneumatic Signal Company, of New York and Chicago, has the contract for building two low-pressure pneumatic interlocking plants for the New York Central at East Rochester, of 41 levers and 37 levers, respectively; also for a similar plant for the same road at South Schenectady, in which there will be 45 levers. The company also has the contract for a large all-electric interlocking at Indiana Harbor, Ind., for the Baltimore & Ohio.

A New Potomac River Dam.

The War Department has approved the application of the Great Falls Power Company for permission to build a dam across the Potomac River at Great Falls, to connect with the Government dam near the Maryland shore. The application has been pending before the War Department for several years, the proposed dam being incidental to the development of the plans of the Great Falls Power Company to establish a large power plant. All differences between the War Department and the company as to the location of the new dam and the effect of its construction upon the water supply of the District of Columbia have been adjusted.

THE SCRAP HEAP.

Notes.

The General Manager of the Fort Worth & Denver City, having received a complaint from the State Railroad Commissioners of Texas that negro passengers were allowed to eat in the dining cars on the company's trains, has written to the commissioners a letter assuring them that it shall not occur again.

Grain dealers of Baltimore and Philadelphia are complaining that their business is being hurt by the high rates charged by the railroads on corn and wheat from the West and that grain which ought to come to those cities is being carried to Montreal, and the members of the Grain Exchange of Baltimore have appointed a committee to go to Philadelphia and confer on the subject.

The railroads centering in St. Paul and Minneapolis have agreed on a plan of daily interchange reports for freight cars by which only one report will have to be made of each delivery. The delivering road will make the report, and after it has been agreed to by the receiving agent will provide four copies, two for each road, so that the receiving agent will have none to make.

It is announced from Chicago that the railroads eastbound from that city will, on Oct. 1, advance the freight rates on flour and grain to the Atlantic seaboard 2 cents per 100 lbs. This will make the rates 20 cents per 100 lbs. (Chicago to New York) on domestic shipments and 17½ cents on those for export. The movement of grain to the Gulf of Mexico is now large. The exports of wheat from New Orleans in August were 843,000 bushels and from Galveston 3,352,000 bushels.

According to the local newspapers, the officers of the New York Central have succeeded in materially mitigating the September rush of baggage at the Grand Central Station, New York, this year, by having some of the incoming baggage checked for the delivery wagons before it reaches the city. A number of baggage cars were taken out from the heavy southbound through trains at Albany and made up in separate baggage trains; and some of these trains were sufficiently far behind the passengers owning the baggage to enable the baggage express men to take the passengers' checks back to Albany and thus tag the trunks in the cars on the way from Albany to New York. Thus, many pieces were delivered directly to wagons without being passed through the baggage rooms. It is said, also, that the baggage express companies now check baggage through from distant cities to residences in New York at the same price that is charged for regular city delivery.

A law which was passed by the New York Legislature at its last session and which is now in effect, ameliorates the condition of railroad men who, by the inflexible penal statutes in force in New York, or in consequence of the unreasoning attitude of the police, are liable to unjust arrest in case of accidents. Henceforth where the employees of a steam, elevated, or street surface railroad are arrested in any city in connection with an accident to or by the engine, train, or car which they are operating, resulting in an injury or death to a person or injury to property, such railroad employee shall be immediately taken before a Magistrate, if one is accessible, or otherwise before a captain or sergeant of police in charge of a police station in such city, and be given an opportunity to be admitted to bail. This is good as far as it goes; but the discretion with which policemen are clothed, by virtue of which they arrest enginemen, motormen or conductors in circumstances where it is plain to the dullest spectator that no crime has been committed, appears to remain unimpaired.

Track Tanks on the P., F. W. & C.

The Pennsylvania Lines West of Pittsburg are considering placing track tanks on the Northwest System between Pittsburg and Chicago. The work has not yet been authorized, but it is probable that there will be tanks at five different points at least.

A New Mining Railroad in Africa.

The firm of Arthur Koppel has taken the contract to build and equip a narrow gage railroad about 400 miles long in Africa. It is for the Otavi Mining & Railroad Co., to serve the copper mines in the district Otavi and Tsumeb in southwestern Africa.

The total cost of the work will be about $4,500,000. To build this road the firm of Arthur Koppel has formed a company with several of the first German banks, and the line is to be finished within 2½ years.

Arthur Koppel builds and equips the road complete, including rails, steel ties, rolling stock and all the other equipment. Fifteen engineers of the firm have already left Hamburg for southwestern Africa to begin the work.

Erie Wants Only Young Beginners.

The Erie Railroad has issued an order calling for the resignation within 30 days of all members of the clerical staffs of its various departments who have reached the age of 35 and have been in the company's employ only since May 1, 1901. In explanation of the order this statement was issued:

"The Erie Railroad Co. owes a duty to men who have been in its employ the major part of their lives, and who, by reason of their term of service, have earned, to some extent, the right to employment. It is constantly making provision for men who have grown old in the service. It is a manifest injustice to all these men to have men who have seen their best days enter the employ of the company. It is to protect the old employees that the order was issued.

"It is fair to assume that a man who has worked at some other business for the better part of his life and has reached the age of 35 is too well grounded in it to be of special value to a railroad company. The aim is to employ young men who wish to make railroading their business, and from the material so employed to promote men as their education and ability permit."

Shipping News.

The *Britannic*, of the White Star Line, has been sold to be broken up, and the *Germanic*, her sister ship, has now made her last trip to the United States, and upon her return will be retired from service. These two vessels, built by Harland & Wolff, at Belfast, over 25 years ago, have been well known for the reliability of their runs, and for the fact that instead of depreciating with age they were running as fast, if not faster, in the last years of their service as in the first. They have been popular passenger vessels from first to last, but are now too small and slow for the requirements of the trade.

The Cunard Line will inaugurate a service to the Mediterranean this fall. The *Aurania* and *Carpathia*, which are now running on the extra service between Liverpool and New York, will be transferred to the Mediterranean trade, and will be followed by other vessels when required. The American port of departure will be Boston, and the *Aurania* and *Carpathia*, as at present, will carry only second-class and steerage. The steamers will sail to Gibraltar, Genoa, Naples, etc. The coming winter is expected to see a large increase in tourist business to the Mediterranean.

A new steamship line between Pensacola, Fla., and various Mediterranean and Adriatic ports will be inaugurated by the Austro-Americana Company, of Trieste, acting in conjunction with the Louisville & Nashville Railroad. The service will be fortnightly, touching at Valencia, Marseilles, Genoa, Leghorn, Naples, etc. No passengers will be carried.

Freight From Manila.

According to press reports the Great Northern has taken a trial shipment of hemp from Manila by way of the Pacific and overland to Chicago, instead of by way of the Suez Canal and through New York. The time occupied in transit was less by about two weeks than over the westward route, and the through rate was approximately 75 cents per 100 lbs., which is considerably lower than the combined water and rail rate by way of New York. As a result of the trial shipment the Dearing Harvester Company has ordered several thousand bales of hemp sent by the Pacific route and over the Great Northern. A large proportion of the hemp consumed in the United States formerly came by way of London and Liverpool, the former port being the hemp market, but since Congress removed the export duty charged in Manila on hemp shipped to this country practically all of the hemp used here has come from the Philippines direct to New York. After the first of next July the Great Northern will have another advantage, for then the United States coasting laws will require transportation in American bottoms, if the rebate amounting to three-eighths of a cent a pound is to be enjoyed. There are practically no American steamers now engaged on the route from Manila to New York by way of the Suez. It is probable, therefore, that as soon as the law goes into operation a great deal of the hemp trade will be thrown to the Pacific route, which is much shorter. Moreover, when the Great Northern puts into commission its two new steamers now building, it will be in a position to profit by the rebate.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular mettings of railroad associations and engineering societies see advertising page xvi.)

Master Car Painters.

The Master Car & Locomotive Painters' Association held its 34th annual convention at Chicago, Sept. 8. The officers elected for the ensuing year are: President, C. A. Cook (Philadelphia, Baltimore & Washington); First Vice-President, John F. Lanferseick (Pennsylvania Railroad); Second Vice-President, H. M. Butts (New York Central & Hudson River), and Secretary and Treasurer, R. McKeon (Erie), Kent, Ohio.

PERSONAL.

—Mr. Samuel Jacobs, a well-known railroad builder, died in St. Joseph, Mo., Sept. 4, aged 82 years.

—Mr. Isaac H. Southwick, for many years a Director of the Providence & Worcester Railroad, died on August 30 at Framingham, Mass. He was about 91 years old.

—Mr. Edward M. Collins, General Superintendent of the Missouri, Kansas & Texas, died on Saturday, Sept. 5, at his home in St. Louis, as the result of an accident suffered several weeks ago.

—Mr. F. A. Torrey, the new Assistant Superintendent of Motive Power of the Chicago, Burlington & Quincy, has been in the service of this company for the past 29 years. He began as a Fireman, then became Engineer, and has since served in various departments until his recent promotion as above.

—Dr. William A. Noyes, Professor of Chemistry at Rose Polytechnic Institute, Terre Haute, Ind., has resigned to accept the position of Chief Chemist of the Bureau of Standards, at Washington, D. C. Dr. Noyes received his degree from Johns Hopkins University, and has been at Rose Polytechnic for several years. He is

editor of the *American Journal of Chemistry* and Secretary of the American Chemical Society.

—Mr. B. A. Worthington, Assistant to Fourth Vice-President and General Manager J. Kruttschnitt of the Southern Pacific, is a native of California, having been born in Sacramento in 1861. His first railroad service dates from 1874, when he began as a messenger on the Central Pacific. He was for some years telegraph operator at Chico, Red Bluff and Sacramento, and for a time ending in 1881 was with the Western Union Telegraph Company. Then he re-entered railroad service and was private secretary to Mr. Stevens, then General Master Mechanic of the Southern Pacific. Two years ago he was appointed Superintendent of the Tucson Division and the following October was transferred to the Coast Division, from which position he now goes to the office of Mr. Kruttschnitt, where he will have charge of improvements and economies in transportation operations through variations in trainloading; distribution and assignment of motive power; investigating and reporting accidents, and of maintenance of and improvement in discipline.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—George F. Randall is General Superintendent at New York City, and C. E. Burr is Superintendent at St. George, Staten Island.

Brunswick & Birmingham.—J. A. McDuffie, Traffic Manager, with office at Brunswick, Ga., has resigned.

Chicago, Burlington & Quincy.—F. A. Torrey has been appointed Assistant Superintendent of Motive Power, with headquarters at Creston, Iowa. A. S. Wilson has been appointed to succeed Mr. Torrey, Master Mechanic, as Acting Master Mechanic, with headquarters at Creston.

Cincinnati, New Orleans & Texas Pacific.—W. A. D. Short has been appointed Superintendent of Signals, with office at Lexington, Ky., in charge of electric and mechanical signals, interlocking and electric light plants. The Superintendent of Telegraph has been relieved of the above mentioned duties.

Colorado & Southern.—W. H. Sheedy, hitherto Roadmaster, has been appointed Superintendent, with headquarters at Cheyenne, Wyo., succeeding J. Q. Mathews, resigned. (See Rio Grande Western.)

Denver & Rio Grande.—C. M. Hobbs, General Purchasing Agent, with office at Denver, Colo., has resigned.

Erie.—H. C. Snyder has been appointed Division Freight Agent, with office at Bradford, Pa., succeeding F. J. Goodfellow, resigned.

Grand Trunk.—U. E. Gillen, hitherto Trainmaster at Belleville, Ont., has been appointed Superintendent, with office at that point.

Great Northern.—H. Hamilton has been appointed Resident Engineer, with headquarters at Havre, Mont., succeeding E. R. McNeill.

Iowa Central.—H. E. Huntington has been elected a Director, succeeding R. J. Kimball, resigned.

Kansas City, St. Joseph & Council Bluffs.—J. H. Dacey has been appointed Master Mechanic, with headquarters at St. Joseph, Mo., succeeding C. E. Lamb.

Kansas City Southern.—N. D. Ballantine, hitherto Superintendent of Telegraph, has been appointed Superintendent of Transportation, with headquarters at Kansas City, Mo., succeeding F. S. Rawlins. R. L. Logan has been appointed to succeed Mr. Ballantine.

Louisville & Nashville.—W. A. Russell has been appointed Assistant General Passenger Agent, with headquarters at Louisville, Ky.

Mexican.—Ernest Muller, Assistant General Freight and Passenger Agent at Mexico, Mex., has resigned.

Northern Pacific.—G. H. Gillman, hitherto Assistant Shop Superintendent, has been appointed Master Car Builder, with headquarters at St. Paul.

Pennsylvania.—E. Lee has been appointed Assistant Engineer, with office at Buffalo, N. Y., succeeding G. P. Miller, transferred.

Pittsburg, Shawmut & Northern.—C. H. Bevington has been appointed Assistant Superintendent, with headquarters at Olean, N. Y.

Rio Grande Western.—Owing to ill health, E. H. Williams, Assistant Superintendent at Salt Lake, has been granted leave of absence, and George Geiger, Assistant Superintendent at Grand Junction, has been transferred to Salt Lake, and Mr. Geiger in turn is succeeded by J. Q. Mathews.

San Francisco & Northwestern.—The Mercantile Trust Company, of San Francisco, has been elected Treasurer of this company, succeeding F. W. Zeile, resigned.

Southern California.—I. L. Hibbard has been appointed Superintendent, with headquarters at San Bernardino, Cal., succeeding W. B. Beamer, resigned.

Toledo & Ohio Central.—The office of President N. Monsarrat will hereafter be in New York.

LOCOMOTIVE BUILDING.

The Mobile & Ohio has ordered 20 locomotives from the Baldwin works.

The Mobile, Jackson & Kansas City is reported to have ordered 10 locomotives from the Baldwin works.

The New York, Chicago & St. Louis denies that it is having any locomotives built at the Baldwin works.

The Nashville, Chattanooga & St. Louis is having 10 locomotives built at the Baldwin works.

The Atchison, Topeka & Santa Fe is having 14 locomotives built at the Baldwin works, in addition to the 26 reported in our issue of May 29.

The Atlantic Coast Line, as reported in our issue of Aug. 28, is having seven simple 10-wheel (4-6-0) locomotives built at the Baldwin works for delivery in the late fall. These locomotives will weigh 140,000 lbs., with 104,000 lbs. on drivers; cylinders, 19 in. x 26 in.; diameter of drivers, 68 in.; straight boiler, with a working steam pressure of 200 lbs.; heating surface, 2,327 sq. ft.; 290 Shelby steel tubes, 2 in. in diameter and 14 ft. 5 in. long; steel fire-box, 96⅜ in. long and 42 in. wide; grate area, 28 sq. ft.; tank capacity, 5,000 gal. of water and coal capacity 10 tons. Special equipment includes: Westinghouse air-brakes, steel axles, Magnesia boiler lagging, Marden brake-beams, Tower couplers, Corning brake-shoes, Dressel headlights, Hancock injectors, Damascus bronze journal bearings, U. S. piston and valve rod packings, Star safety valves and steam gages, Waters sanding devices, Nathan sight-feed lubricators, Gold heating equipment, and cast-steel wheel centers.

CAR BUILDING.

The American Car & Foundry Co. has miscellaneous orders for 164 cars.

The Orange & Northwestern is reported in the market for 25 oil tank cars.

The Carolina & Northwestern is reported in the market for a number of freight cars.

The National R. R. of Mexico is having one coach built by Harlan & Hollingsworth.

The Maine Central is having 500 coal cars built by the Laconia Car Co. at Laconia, N. H.

The New Orleans & Northeastern has ordered 20 ballast cars from the Rodger Ballast Car Co.

The Detroit & Toledo Coal Co. has ordered 10 cars from the American Car & Foundry Co.

The St. Joseph & Grand Island is having 50 freights built at the Detroit works of the American Car & Foundry Co.

The Gulf City Construction Co. is having 50 freights built at the Jeffersonville works of the American Car & Foundry Co.

The St. Louis & Belleville (Electric) is having 100 coal cars built at the Madison works of the American Car & Foundry Co. This order was reported in our issue of Sept. 4.

The St. Louis & San Francisco has filed an equipment contract amounting to $2,104,000, for the purchase of 100 locomotives, 27 passenger coaches, six postal cars and one dining car.

The Richmond, Fredericksburg & Potomac has ordered 20 ballast cars from the Rodger Ballast Car Co. and not from the American Car & Foundry Co., as stated in our issue of Sept. 4.

The Mexican Central has ordered 790 box cars, 60,000 lbs. capacity; 150 stock cars, 60,000 lbs. capacity; 100 coal cars, 80,000 lbs. capacity, and 100 flat cars, 80,000 lbs. capacity, from the Pullman Co.

The Trinity & Brazos Valley, as reported in our issue of Aug. 28, is having 50 box cars built by the Georgia Car & Mfg. Co. These cars will be 36 ft. long, 8 ft. 6 in. wide, and 8 ft. high, all inside measurements, and will have a capacity of 60,000 lbs.

The Southern Ry. has asked bids on 50 eight-wheel and 50 four-wheel cabooses. The eight-wheel cabooses will be 36 ft. 7½ in. long over dead blocks, 31 ft. 4⅞ in. long inside of lining; 9 ft. 1½ in. wide over eaves, 8 ft. ⅛ in. wide inside of lining, and 6 ft. 7½ in. high from top of floor to bottom of carline. The four-wheel cabooses will be 20 ft. long over dead blocks, 14 ft. 6 in. long inside of lining; 9 ft. 4⅝ in. wide over eaves, 8 ft. 6⅛ in. wide inside of lining, and 6 ft. 3¼ in. high from top of floor to bottom of carline. The special equipment includes: Simplex bolsters for eight-wheel cabooses, Damascus brake-beams, Congdon brake-shoes, Westinghouse air-brakes for eight-wheel cabooses, Ajax brasses, Tower couplers, Miner tandem draft rigging, McCord journal boxes and lids. Southern Railway standard paint and roofs, and Railway Steel-Spring Co.'s springs.

BRIDGE BUILDING.

AMERICAN FALLS, IDAHO.—Bids are wanted Sept. 15, by the Commissioner of Bridges, for building a steel bridge, consisting of two spans each 100 ft. long, over the Snake River.

CHATTANOOGA, TENN.—A viaduct to cost $20,000, it is said, will be built in Chattanooga jointly by the County, the Cincinnati, New Orleans & Texas Pacific Railway and the Chattanooga Electric Railway Co.

CHICAGO, ILL.—Bids are wanted Oct. 1, by U. S. Engineer Office, 1637 Indiana avenue, Chicago, for building foundations and piers for four aqueduct bridges on western section of the Illinois & Mississippi Canal. C. S. Riche, Captain, Engineers.

COLORADO SPRINGS, COLO.—Improvement to be made by the Atchison, Topeka & Santa Fe include the building of a steel trestle with concrete arches and buttresses, to carry the tracks over Costilla street; this work to cost about $60,000.

COLUMBUS, GA.—The City Council has appointed a committee to arrange for a new steel bridge over the Chattahoochee River at Dillingham street.

CRAWFORDSVILLE, IND.—Montgomery County Commissioners are preparing plans for a new bridge at Yountsville in Ripley Township, and bids may soon be asked.

DENVER, COLO.—Repairs may soon be made, at a cost of $15,000, to the Twenty-third street viaduct.

DES MOINES, IOWA.—Bids are wanted Sept. 22, by the Board of Public Works, for the East Sixth street bridge over the Des Moines River. It is to be a steel structure 703 ft. long, 21 ft. roadway and sidewalks 6 ft. wide on each side; work must begin Nov. 1 and be completed in eleven months. (Sept. 4, p. 641.)

FLINT, MICH.—Plans are being made by the Pere Marquette to build a new bridge over the Flint River.

FREDERICTON, N. B.—Bids are wanted Sept. 21, by the Department of Public Works, for substructure of French Fort Cove bridge, also for Bathurst Basin bridge.

FRESNO, CAL.—Bids are wanted Sept. 14 by W. O. Miles, County Clerk, for a bridge over Gold Slough near Eaton.

INDIANAPOLIS, IND.—The Southern Construction & Equipment Co. will let the bridge contracts on the line of the Indianapolis Southern, between Indianapolis and Sullivan, now under construction.

Bids are wanted Sept. 26 by Marion County Board of Commissioners for a plate-girder bridge over Fall Creek. H. B. Smith, Auditor.

MINNEAPOLIS, MINN.—The Holden street and Western avenue bridges will be rebuilt by the Minneapolis & St. Louis, or the city.

MONTEREY, MEXICO.—The large bridge on the Monterey & Mineral Belt over the San Juan River, which was swept away by recent floods, wil be replaced by a stronger structure.

NEW YORK, N. Y.—Proposals are asked by the Commissioner of Emigration, for the construction of an island and a certain gangway in New York Harbor, near Ellis Island. Copies of specification and plans can be obtained at the office of Chief Engineer, Post Office Building.

The New York, New Haven & Hartford has awarded contracts for the substructure to Holbrook, Cabot & Rollins, for superstructure to McClinter-Marshall Construction Co., of the bridge to be built at Westchester avenue over its tracks.

RIPARIA, WASH.—The Oregon, Washington & Idaho will build a bridge about 1,200 ft. long over a river on its line between Riparia, Wash., and Lewiston, Idaho. (See map under Railroad Construction.)

ST. LOUIS, MO.—The Missouri, Kansas & Texas, reports say, will replace many trestles with iron structures.

SAN ANTONIO, TEX.—Bids are wanted Oct. 10, by the County Clerk, for roads and bridges in Bexar County to the amount of $500,000.

SPRINGFIELD, ORE.—The Southern Pacific will, it is reported, build a bridge over the Willamette River at Springfield.

SULLIVAN, ILL.—Three bridges may soon be built at this place, and a $10,000 bond issue to cover this expense is being considered.

TOLEDO, OHIO.—The Council has under consideration the building of two bridges, one over the Maumee River from Cherry street to Goose Point, and one from Cherry street to a point near the Wheeling & Lake Erie bridge.

VERONA, PA.—We are told that the Wilkinsburg & Verona Street Railway Co. is preparing plans for a viaduct over the Pennsylvania tracks in Verona, but that they are not as yet in definite shape.

WALHALLA, S. C.—Oconee County, S. C., and Habersham County, Ga., reports say, will jointly rebuild the Prather bridge over Tougaloo River. Contract is to be awarded Oct. 8.

WEISER, IDAHO.—Bids are wanted Sept. 15, by Dr. B. L. Steeves, Secy. Bridge Commissioners, for building a steel bridge consisting of five spans each 140 ft. long, over the Snake River near Weiser.

YORK, PA.—The viewers appointed by the county recommend the building of a bridge over Codorna Creek from North Hopewell to Springfield Township.

ZANESVILLE, OHIO.—To comply with the Government requirements a change will be made in the bridge at Gaysport at an expense of $20,000.

Other Structures.

ALGIERS, LA.—An extension of 80 ft. will be made to the car shops of Morgan's Louisiana & Texas Railroad.

AUSTIN, TEXAS.—Architect Charles H. Page, Jr., of Austin, is preparing plans and specifications for fourteen new passenger stations to be built along the line of the Trinity & Brazos Valley at a total cost of about $35,000. The contract for their construction will be let in a few weeks.

BROOKLYN, N. Y.—Work will soon be commenced on the large power house of the Pennsylvania-Long Island tunnel in Brooklyn and for the Atlantic Division of the Long Island road.

FLORENCE, S. C.—Improvements which reports say will be made at the Atlantic Coast Line machine shops in Florence will double their capacity.

LOGANSPORT, IND.—The Wabash, according to local press reports, will build a station to cost $25,000.

MASSILLON, OHIO.—The Baltimore & Ohio will, it is reported, make a number of improvements in Massillon, including a new station.

MCKEESPORT, PA.—Plans are being prepared by the West Side Belt Railroad for the building of a roundhouse and shops at Summit, near Castle Shannon. It is intended to spend $75,000 in improvements to make Summit a terminal point.

RUSK, TEXAS.—It is stated that the St. Louis Southwestern of Texas will build a new station at this place.

ST. LOUIS, MO.—Press reports say that the Wabash has instructed its architect, Theo. C. Link, to prepare plans for its proposed passenger station at the World's Fair grounds. In connection with the station, the company also contemplates building a hotel and restaurant. The plans will be for a 4-story building, with 150 to 200 rooms for guests in the upper stories, the lower portions for passenger and restaurant purposes.

WASHINGTON, D. C.—The Secretary of Agriculture has let the contract for the preparation of plans and specifications for the new building for the Department of Agriculture to Rankin, Kellogg & Crane of Philadelphia, at 3½ per cent. of the cost of the building. The appropriation for the building is $1,500,000.

WATERTOWN, WIS.—The Chicago & North Western will, it is stated, build a passenger station for which plans are completed, and will also build a freight house.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

AMARILLO, PLAINVIEW & SOUTHERN.—A contract for building this road from Amarillo, Tex., south through Randell, Swisher and Hale counties to Plainview, 75 miles, has been let to E. C. Gordon, J. M. Donohue is President, and R. P. Smith, Secretary. The chief office of the company is at Plainview, Texas. (Aug. 21, p. 610.)

ARIZONA, NEW MEXICO & COLORADO.—It is stated that location surveys will soon be made for this proposed railroad in New Mexico. The object of the line is to open up the coal fields in Socorro and Valencia counties. It is reported that it will eventually be extended to a point in Cochise County, Ariz. F. W. Kinnee, Cochise, Ariz., is President.

CANADIAN PACIFIC.—At a recent meeting of the directors of this company an extension from Regina, N. W. T., to Arcola, 113 miles, was authorized. An issue of 4 per cent. consolidated debenture stock will be made to pay for this construction work.

CENTRAL OF ARKANSAS.—The newspapers say that a contract has been let to the Central Construction Company, Fort Smith, Ark., for building the first 50 miles of this road south from Dardanelle, Ark. The line will eventually be extended to Hot Springs. F. A. Molitor, Fort Smith, Ark., is President. (June 12, p. 416.)

CHICAGO & NORTHWESTERN LAKES (ELECTRIC).—Articles of incorporation have been filed by this company in Wisconsin. It is proposed to build an electric railroad from Chicago northwest to Kilbourn, Wis., 160 miles. The new line will pass through McHenry County in Illinois, and Kenosha, Walworth, Jefferson and Dane counties in Wisconsin. Alexander Clark, Chicago; E. P. Wheeler, Lake Geneva, Wis., and others are incorporators.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.—The newspapers say that work has been completed on a branch line from Cleveland, Minn., northeast to Le Sueur Center, 7 miles.

COLORADO, OKLAHOMA & TEXAS.—Surveys are reported in progress for this line from Pueblo, Colo., to Denison, Tex., 450 miles. The road will pass through the southwestern portion of the Chickasaw Reservation, Ind. T., and through Comanche, Kiowa, Washita and other counties in Oklahoma. E. E. Colby, Pueblo, Colo., is Chief Engineer. (May 29, p. 384.)

COLUMBIA RIVER & NORTHERN.—This road has been completed between Lyle, Wash., and Goldendale, 42 miles, and trains will soon begin running. H. C. Campbell, Portland, Ore., is interested. (See Construction Supplement.)

COOS BAY, ROSEBURG & SALT LAKE.—It is reported that work will be begun at once on this proposed road from Coos Bay, Ore., east to Roseburg via Remote and Camas, 70 miles. Surveys were completed some time ago. L. V. Kinney, Portland, Ore., is interested.

DUBOIS SOUTHWESTERN.—A charter has been granted this company in Pennsylvania to build from Sykesville, Jefferson County, to South Bend, Armstrong County, 50 miles. F. H. and C. W. Goodyear of Buffalo are among the incorporators. It is stated that this company has been incorporated for the purpose of building an extension of the Buffalo & Susquehanna to Sykesville.

ERIE.—It is stated that the contracts for building a double track on the Allegheny division between Almond, N. Y., and Tip Top, eight miles, have been let. Work will be begun at once, and will be in charge of F. W. Allen, Division Engineer.

EXCELSIOR SPRINGS & MISSOURI CITY (ELECTRIC).—A charter has been granted this company in Missouri. An electric railroad will be built from Excelsior Springs to Missouri City, both in Clay County, a distance of 10 miles. J. W. Creech, Harrington, Kan.; L. S. Parker, Jefferson City, Mo.; Maurice A. Wogan, St. Joseph, Mo., and others are incorporators.

FORT BRAGG & SOUTHEASTERN.—Press reports state that rights of way have been practically all secured by this road for its proposed line from Fort Bragg, Cal., southeast to Healdsburg, 40 miles. W. J. Dingee, Oakland, Cal., is said to be interested. (April 3, p. 255.)

GREAT EASTERN & WESTERN.—A territorial charter has been granted this company in Oklahoma. It is proposed to build from Madge, Greer County, east through Indian Territory to Huntington, Ark., approximately 300 miles. The names of incorporators are not stated.

GREAT WESTERN (ELECTRIC).—It is reported that this road which was built last year betwen Loveland, Colo., and Berthoud, 22 miles, will be extended from its present terminus at Berthoud. Charles Boettcher, Denver, Colo., is President. The headquarters of the company are at Loveland. (See Construction Supplement.)

GULF, COLORADO & SANTA FE (ATCHISON, TOPEKA & SANTA FE).—Track laying is practically completed on the extension of this road from San Augustine, Tex., to Center, 20 miles. It is stated that trains will be running about October 1, 1903. C. F. W. Felt, Galveston, Tex., is Chief Engineer.

HAYNEVILLE R. R.—Grading is reported begun on this road, which is building from Hayneville, Ala., east to Morganville, 10 miles. Connection will be made with the Louisville & Nashville at Morganville. H. S. Houghton, Hayneville, Ala., is interested. (June 26, p. 478.)

ILLINOIS CENTRAL.—The new branch from Paducah, Ky., on the Louisville Division, west to Cairo, Ill., 32 miles, is practically completed, and will soon be opened for business. (May 9, p. 354.)

INDIANAPOLIS SOUTHERN.—The Southern Construction & Equipment Co., which recently received the contract for building this road, has let a contract to the Kenefick Construction Co., Pittsburg, Pa., for grading and concrete work on the 127 miles of track between Indianapolis and Sullivan. Work will be begun at once, and includes 1,100 ft. of tunneling near Stanford in Lawrence County. (Sept. 4, p. 642.)

KENTUCKY ROADS (ELECTRIC).—It is reported that an electric railroad will be built from Paducah, Ky., west to Cairo, Ill., 35 miles. The names of those interested are not stated.

LANCASTER & COATESVILLE (ELECTRIC).—A charter has been granted this company in Pennsylvania, to build an electric railroad from a point in Lancaster County near Witmer east through Intercourse, White Horse, Cains, Compass and Wogentown to Coatesville, Chester County, 25 miles. A. C. Baldwin, Cains, Pa., is President.

LOUISIANA & SOUTHEASTERN.—This company has been chartered in Louisiana to build from Thibodaux southeast to Cutoff, La., 35 miles. Jules Godchaux is President, and C. S. Matthews, Thibodaux, La., Vice-President.

MARION COUNTY.—This company has been chartered in Arkansas. It will build from a point on the White River in Baxter County, in a westerly direction to a point not yet determined in Marion County, Ark. J. C. South, Thomas Combs, F. J. McLean, St. Louis, Mo.; Geo. E. Dodge and J. E. Williams, Little Rock, Ark., and others are interested.

MEMPHIS & SHREVEPORT.—Articles of incorporation have been filed by this company in Louisiana. It is proposed to build from Shreveport northeast through Minden, La., to Homer, 45 miles, and eventually to Memphis, Tenn. A. K. Clingman, Homer, La., is President, and S. G. Webb, Minden, La., is Secretary.

MEXICAN CENTRAL.—It is reported that preliminary surveys are now being made for an extension of this road from a point north of Chihuahua, Mexico, to Cananea, 250 miles.

MEXICAN ROADS.—The Compania Explotadora de Minas de Carbon de Michoacan proposes building a railroad from its coal properties in the State of Michoacan to a point on the National Railroad of Mexico.

The contract for building a railroad through the El Oro and Tlalpujahua mining districts has been let to Messrs. Byers & King. Surveys were completed some time ago.

It is stated that work will soon be begun on a railroad between Linares and San Jose. The San Carlos Copper Co., of San Jose, is behind the project. E. B. Self is Manager.

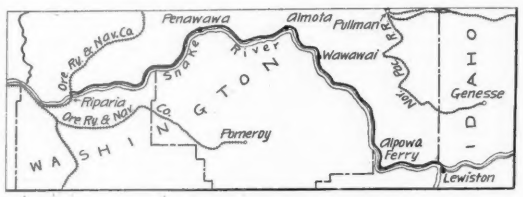
Adolfo Celada has applied to the Mexican Government for a concession to build and operate a railroad from the coal fields of Rancho del Agostadero to a point on the line of the National Railroad of Mexico. The route of the proposed road is through the districts of Zitacuaro, Zinapecuaro and Maravatio.

MORNING STAR.—Press reports state that work will shortly be begun on this road from Yellville, Ark., southeast to Newport, 80 miles, passing through Marion, Searcy, Stone and Independence counties. Bonds to the amount of $3,500,000 have been placed by this company with the Equitable Trust Co., New York. C. Williams, Rush, Ark., is said to be interested. (See Construction Supplement.)

NELSON & ALBEMARLE.—A charter has been granted this company to build a line from Soapstone Quarry, a point 10 miles south of Chatham, Va., east to a connection with the Southern Railway, eight miles. J. W. Foster, H. L. Lane, D. J. Carroll, J. G. Hopkins and G. W. Bostwick, Roanoke, Va., are incorporators.

NORFOLK & WESTERN.—An officer says that the double track from Williamson, W. Va., to Hatfield Tunnel will be completed by Sept. 15. Grading has been begun on the new coal road up Buffalo Creek, W. Va. This line will connect with the main line of the Norfolk & Western at Barger Siding, W. Va. Location surveys have been made, and the contract let to Walton & Co. for building a branch line from Williamson to the coal fields on the opposite side of the mountain from the Buffalo Creek road.

OREGON, WASHINGTON & IDAHO.—An officer writes that this company, which was recently incorporated in Oregon, will build a line from Riparia, Wash., along the Snake River in an easterly direction to Lewiston, Idaho, 55 miles. The work will be comparatively light, with a



maximum grade of 15 feet per mile, and a maximum curvature of 3 deg. There will be one bridge 1,200 ft. long. A. H. Mohler is President, and W. H. Kennedy, Chief Engineer, Riparia, Wash. The accompanying map shows the proposed route of the railroad. (Aug. 21, p. 610.)

PITTSBURG, CARNEGIE & WESTERN.—It is reported that this railroad, the Wabash extension to Pittsburg, from Jewett, Ohio, through Patterson's Mills and Carnegie to Pittsburg, is entirely graded, and that track laying has been begun.

PORTLAND, NEHALEM & TILLAMOOK.—Surveys are reported finished for this proposed line from Portland, Ore., to Tillamook, 90 miles. A branch line is now under survey from a point near Portland to Nehalem. John McCracken is President, and William Reed, Superintendent, both of Portland, Ore. (See Construction Supplement.)

RUSK & SOUTHWESTERN.—Articles of incorporation have been filed by this company in Texas. The purpose as stated is to lease from the State of Texas and operate the railroad which runs from Rusk to a point 20 miles east. The road is to be extended to a point on the Neches River. W. H. Knox, C. W. Hawley and W. F. Robertson, Dallas, Texas; E. L. Gregg, Robert Pryor and S. P. Wilson, Rusk, Texas, are incorporators.

ST. LOUIS & NORTH ARKANSAS.—An officer denies the report that contracts have been let for an extension from Marshall, Ark., southeast to Quitman, 45 miles. No immediate action in this direction is contemplated by the company. The road at present runs from Seligman, Mo., to Marshall, Ark., 130 miles.

SEBASTIAN COUNTY (ELECTRIC).—Incorporation has been granted this company in Arkansas. It is proposed to build an electric railroad from Fort Smith south through Jenny Lind, Greenwood, Huntington, Hartford and Montreal, 40 miles, all in Sebastian County. S. A. Williams is President, and Warten Carroll, Secretary, both of Fort Smith, Ark.

TENNESSEE CENTRAL.—Press reports state that work has been begun on a 15 mile extension of the Crawford branch, from its present terminal at Crawford northeast into timber lands in Fentress County.

TEXAS ROADS.—The newspapers say that the Haywood Lumber Company of Davenport, Ia., will build a railroad from its mill at Nacogdoches, Tex., to a point on the St. Louis Southwestern, a few miles north of Lufkin, 15 miles. Surveys are now being made. The new line will parallel the Southern Pacific between these points, and will follow the grade of the Red River, Sabine & Western, which was built in 1889.

WASHINGTON & STATE LINE.—A charter has been granted this company in Pennsylvania, to build from Tylerdale, a point near Washington, west to Dunsfort, 10 miles. Connection will be made with the Baltimore & Ohio, and the Waynesburg & Washington at Tylerdale.

WESTERN MARYLAND.—J. T. Bridges & Co., Hancock, Md., have received a contract for 100,000 sleepers to be used on the extension now being built from Cumberland to Cherry Run.

WESTERN PACIFIC.—A recent article in the *San Francisco Bulletin* says: "Surveys on the Western Pacific are nearing completion. There are at present 30 surveying parties in the field between this city and Salt Lake. By next week the surveys across Nevada will be finished. Surveyors are already working west from Salt Lake to meet those who will cross the Nevada State line pushing eastward. There are no difficult grades or railroad problems in Utah, so the completion of the surveys may be looked for in the early winter. For some distance along the Humboldt River the route will parallel the contemplated cut-off of the Southern Pacific. It will pass about four miles north of Battle Mountain on the Southern Pacific, and from there push east through Palisade Canyon. The only problem in Utah will be the trestle across the southern arm of the great Salt Lake, which is in contemplation. If it is not too difficult and expensive, owing to the sandy bottom of the lake, the southern arm will be bridged in the same manner in which the Southern Pacific is now building a 40-mile trestle across the northern arm on its Lucin cut-off."

GENERAL RAILROAD NEWS.

CANADIAN NORTHERN.—It has been officially announced by the officers of this road that owing to the probable building of the Grand Trunk Pacific across the continent from Moncton, N. B., to Port Simpson, the Canadian Northern will abandon its projected transcontinental line.

CHARLESTON, CLENDENNIN & SUTTON.—See Coal & Coke R. R. below.

CHICAGO GREAT WESTERN.—This company has begun to run trains to and from Council Bluffs, over the extension from Fort Dodge. An officer says that as soon as possible the company will put on through trains between Chicago and Omaha, and from Minneapolis and St. Paul to Omaha, both ways. The Chicago Great Western proposes then to make as good time between these points as the other railroads. The extension from Council Bluffs to Fort Dodge is 133 miles long, and it has been built in a little over a year.

The gross earnings for this company for the fiscal year ending June 30 were $7,823,190, an increase of $273,502; operating expenses were $5,434,629, an increase of $149,939, leaving an increase in net earnings of $124,433. Passenger earnings increased 6.18 per cent., and gross receipts increased about 3.62 per cent.

CHICAGO, MILWAUKEE & ST. PAUL.—This company has opened its cut-off between Kansas City and Muscatine. This line will give the St. Paul a through line from Chicago to Kansas City only 485 miles long. Beginning Oct. 1, the through passenger trains will be run over the cut-off.

COAL & COKE.—This company has gained control of the Charleston, Clendennin & Sutton, and will operate it in future as its Charleston division. The latter road runs between Charleston, W. Va., and Clay Court House, a distance of 51 miles. The Coal & Coke has recently completed its main line between Durbin and Elkins, W. Va., 47 miles, and is allied with the West Virginia Central & Pittsburg interests.

CRYSTAL RIVER.—See Denver & Rio Grande below.

DENVER & RIO GRANDE.—It is announced that this company has acquired control of the Crystal River Railroad which runs between Redstone, Colo., and Coal Basin, 12 miles, and between Carbondale and Placita, 20 miles.

DETROIT & TOLEDO SHORE LINE.—See Grand Trunk below.

GRAND TRUNK.—The Grand Trunk and the Toledo, St. Louis & Western have opened for traffic the Detroit & Toledo Shore Line, which they jointly purchased in December, 1902. For the present, it is said that only freight will be carried over this line, but in the spring passenger trains will be run.

ILLINOIS SOUTHERN.—At the next meeting of the stockholders of this company on October 15, a vote will be taken on the question of purchasing the property and corporate rights of the Southern Missouri Railroad, and of creating an issue of $5,000,000 4 per cent. first mortgage fifty-year gold bonds. The Southern Missouri recently completed its line from Little Rock Landing to Bismark, Mo., 43 miles.

LONDON & NORTH WESTERN (ENGLAND).—The report of this road for the six months ending June 30, was as follows: Passenger earnings, $11,018,185; freight earnings, $19,321,065; express and mail earnings, $3,061,425; other earnings, $1,604,140; making total earnings of $35,004,815, an increase of $621,655. Total operating expenses were $22,525,515, leaving net earnings of $12,479,200, an increase of $540,555. The number of passengers carried was 40,930,624, a decrease of 50,226. The number of tons of freight carried was 22,576,046, an increase of 614,231.

MEXICAN CENTRAL.—An extension of time until Sept. 30 has been granted by Ladenburg, Thalmann & Co. to the depositors of the first and second income bonds of this company. According to the terms of the original agreement, these bonds were to be deposited before Sept. 6, in exchange for new debenture certificates.

MEXICAN INTERNATIONAL.—See National of Mexico below.

NATIONAL OF MEXICO.—It has been officially announced that this company will be consolidated with the Mexican International on Oct. 1. Joint offices will be opened in the City of Mexico.

NORTHERN CENTRAL.—At a recent meeting of the directors a resolution was adopted authorizing an increase in the capital stock and it will be passed upon at the meeting of the stockholders to be held Nov. 9. The amount of the proposed increase in capital is not stated.

OHIO RIVER & COLUMBUS.—A mortgage for $1,000,000 has been filed by this company with the Union Savings Bank & Trust Co. of Cincinnati to secure bonds for the construction of a steam or electric road from Columbus through Franklin, Madison, Fayette, Highland and Brown counties, to Maysville, Ky.

PACIFIC MAIL STEAMSHIP.—The annual report shows that after making the customary charges for depreciation and for general and extraordinary repairs of steamers, amounting to $314,823, the year's operations have resulted in a surplus of $8,280, against a deficit of $307,935 in the preceding year. Compared with the operations of 1902 the receipts from steamers operated and chartered increased $794,500, and the receipts from other sources $3,660, a total increase of $798,160. There was a shrinkage in earnings in 1902, from a combination of unfavorable circumstances, the earthquake in Guatemala unsettled business in that republic, a quarantine existed at some of the Mexican ports, the low price of silver reduced the exports to all countries on a silver basis, and some business was diverted by the low rates made by the Suez canal lines. Since Sept. 30, 1902, the company has put into service the new steamships Korea and Siberia, at a cost of $3,979,114.